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Always Combat-Ready

18010445a Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 89 (signed to press 10 Jan 89) pp 3-6

[Unattributed lead article]

[Text] Resolutions of the 27th CPSU Congress and the revolutionary nature of the new political thinking are promoting the appearance of the most advanced theoretical views and realization of practical conclusions in defense organizational development and in preparing the Soviet people and Armed Forces personnel for defense of the socialist homeland. Today our country is characterized by realism in assessing the world political situation and by a profound understanding of the points of Soviet military doctrine to the effect that we never will be first to employ nuclear weapons, that we have no territorial claims on any state, and that under no circumstances will we begin fighting against anyone at all if we ourselves are not the object of armed attack.

A constant readiness to defend their Motherland is an important trait of Soviet servicemen's defense awareness. This is persuasively shown by history and by the combat record of the USSR Armed Forces. Our valorous Army and Navy invariably won convincing victories over enemies in engagements and battles for the freedom, honor and independence of the homeland.

Pages of the heroic annals of the Workers' and Peasants' Red Army, established by V. I. Lenin's decree, are vivid and unforgettable. This was a new type of Army which covered itself with immortal glory in the Civil War and in repelling foreign intervention. Fighting men who were hungry, who needed clothing and shoes, and who were poorly armed but utterly dedicated to the cause of the Revolution acted in defense of the socialist homeland and the achievements of October. They routed well-trained forces of the counterrevolution, which were being supported by imperialists of the West and East. The fiery Civil War front ran across the entire country. The will of the people, who did everything to assist the young Army and who lived and acted under the motto "Everything for victory!", won in a mortal clash.

Exploits by legendary heroes of the young Red Army who steadfastly defended the Revolution and who later displayed wonders of staunchness and valor in winning decisive victories at Lake Khasan, on the Khalkhin-Gol River and in other battles, will remain forever in the people's memory. The victory in the Great Patriotic War is one of the most glorious pages in the history of the USSR Armed Forces. That war surpassed military conflicts of the past in scale, number of participants, amount of military equipment, ferocity of battles, human losses, and losses from destruction.

Defense of the world's first socialist state against fascist Germany's aggression was a severe test of the strength of the Soviet state, the cohesiveness of its peoples, and the ability of the Armed Forces to reliably defend our Motherland's freedom and independence. Combat operations continued for 1,418 days and nights without letup across an enormous front from the Arctic Ocean to the Black Sea. As a result, Soviet citizens defended the Great October Revolution's achievements at the cost of unprecedented sacrifices and enormous efforts.

The grandiose battles in which combat exploits of Soviet soldiers won unfading glory went down as golden pages in Army and Navy annals. Just six months after attacking the USSR, the fascist hordes suffered a crushing defeat at Moscow for the first time in World War II. Our troops disrupted Hitler's plan for a blitzkrieg and dispelled the myth of the invaders' invincibility. Subsequently the fascist German armies suffered defeat in the Battle of Stalingrad, which decided once and for all the question of a radical turning point in the Great Patriotic War. Victories of Soviet arms in the Battle of the Kursk Salient and in the 1943 summer-fall offensive placed the fascist leadership face to face with inevitable military catastrophe. Our Army demonstrated powerful strength in the decisive engagements of 1944. After clearing Soviet soil of the fascist hordes, it shifted combat operations onto the territory of a number of European countries and then victoriously concluded the war by taking Berlin and liberating Prague. The German command signed the document of Germany's unconditional surrender on 8 May 1945. The largest armed action by the shock forces of world imperialism against the Soviet Union, the first country of socialism, thus ended ingloriously.

The Great Patriotic War was part of World War II. The victory of the Soviet Armed Forces over Hitler Germany and militarist Japan was of decisive importance in defeat of the fascist bloc and victory for countries of the anti-Hitler coalition in World War II. It led to the liberation of a number of countries of Europe and Asia from fascist enslavement and restoration of their independence, and it created conditions for radical social changes in the lives of many world states.

The talent of outstanding military leaders who had emerged from the midst of the people was revealed in its fullest in the Great Patriotic War. They included G. K. Zhukov, K. K. Rokossovskiy, A. M. Vasilevskiy, I. S. Konev and many other famed marshals, as well as generals and officers who commanded armies, corps, divisions, regiments and battalions. But the simple Soviet soldier, flesh and blood of the people, the great toiler, a courageous person who loves his homeland, bore the brunt of the war.

The Communist Party was the inspirer and organizer of military activities. At the front party members were first to rise up for an assault, drawing the others after them by example. Soviet citizens sensed as never before that the

Leninist party was their native party and that party members were demonstrating in action what it means to be the vanguard of the people when the flame of war rages and when it is a question of life or death. Having assumed full responsibility for the destiny of the homeland and socialism, in the very first war days the Communist Party drew up a program for restructuring the country's life and mobilizing all personnel and resources to rebuff the enemy. V. I. Lenin's immortal ideas about defense of the socialist homeland and his statements that if matters came down to war, then everything must be subordinated to its interests were made the basis of this program.

The Soviet Union's victory over fascist Germany proved not only the indisputable advantages of the USSR's economic and political system, but also the great force of communist ideology, the Soviet people's spiritual weapon. Victory in the Great Patriotic War confirmed the powerful vital force of Marxist-Leninist ideology. A profound ideological conviction and boundless faith in the righteousness of the great Leninist cause served as an inexhaustible source of spiritual forces and of moral-political cohesiveness of all peoples of our country.

The Soviet military art was the most important factor of the victory. In the years of the most difficult ordeals there was constant opposition in the sphere of embodying provisions of the military art in the practice of warfare. The foremost character of our military art, which surpassed that of the enemy, was most fully revealed during combat operations, but historical truth does not suit everyone. In particular, in falsifying Great Patriotic War history bourgeois scientists and propagandists pursue far-reaching objectives in accordance with the social order of imperialist circles. These objectives are not only to blacken the Soviet people's historical past, but also to support ideological preparation for modern warfare. They lead the western reader to the thought that the Soviet Union's defensive capability can have "vulnerable places" and "chinks," and that these should be deepened to successfully implement revanchist schemes.

Bourgeois historiography is constantly augmented with new works on World War II. Since 1945 over 10,000 of them have been published in the United States alone. The proportion of works among them devoted to events at the Soviet-German front continues to grow. In recent years attempts by western historians to downgrade the role of these events and hide them among insignificant engagements at other fronts have been giving way to a forced trend toward a realistic assessment of the influence of the Great Patriotic War on the course and outcome of World War II.

The Land of Soviets always worthily responded to challenges cast it by forces of reaction and aggression in the past. Today's capacity of the USSR to maintain its defensive ability and simultaneously resolve social and other problems has increased considerably. A further growth in this capacity will be served by implementing a course toward revolutionary perestroyka and toward acceleration of the country's socioeconomic development worked out by the April 1985 CPSU Central Committee Plenum and the 27th party congress.

At the present time, as before, the Soviet Union would prefer that its resources and its economic and scientific-technical achievements not be directed toward military purposes, but it is forced to do this inasmuch as imperialism's aggressive preparations demand that a protection of the socialist homeland be organized. It stands to reason that everything being done to maintain constant combat readiness of the Armed Forces is fully subordinated to objectives of the country's reliable defense. The funds and resources being allocated to this are determined by the bounds of necessity and sufficiency for ensuring security of the Soviet state and its allies.

In ensuring security, the USSR is forced to take account of the scope and nature of the threat to peace on the part of imperialist forces. Cloaked in peaceloving phraseology, reactionary imperialist circles continue to unwind the flywheel of the arms race. For example, the amount of funds allocated annually to the Pentagon just within the scope of the official military budget more than doubled in the current decade, going from $140.7 billion in FY 1980 to $283 in FY 1989. It is expected that cumulative military appropriations in the United States will comprise an astronomic figure of around $1.8 trillion in the period FY 1987-1992.

The United States and NATO are accelerating fulfillment of large-scale programs for the creation and production of weapons and military equipment. Plans are being developed to "compensate" for American missiles being eliminated (under the INF treaty) by "modernizing" tactical nuclear arms, stationing an additional number of combat aircraft in Western Europe, and building up the arsenal of sea-launched cruise missiles aboard U.S. ships and submarines plying the waters off European shores. NATO military theory and practice is built on a foundation of the concept of "nuclear deterrence" and the aggressive doctrines of "direct confrontation" and "flexible response." This confronts the Soviet Army and Navy with the need to do everything possible to preclude aggression on the part of imperialism and to guarantee reliable protection of the peaceful labor of the Soviet Union and its allies.

The following priority directions in the work of our Armed Forces have been moved to the forefront for this purpose. Above all it is the development of the military art and an improvement in the combat proficiency of personnel, one of the inexhaustible sources for a further improvement in Army and Navy combat effectiveness. There also has been a change in the direction of operational and combat training of Army and Navy forces. Defense will be the primary form of combat operations in repelling aggression at the beginning of a war, should

one be imposed on us. Increasing efficiency, maintaining firm regulation order, and strengthening military discipline are given special attention among troops and fleets.

As noted at the 19th All-Union CPSU Conference, the defensive nature of Soviet military doctrine and primary emphasis on qualitative parameters of Armed Forces organizational development and training demand assurance of reliable defense with consideration of the nature of the military threat and the conduct of defensive measures within the bounds of strict sufficiency while not accelerating but, to the contrary, slowing down the arms race in every way. The defensive nature of military doctrine demands higher combat readiness. As historical experience shows, an aggressor who is preparing for an attack carries out all necessary measures secretly in advance. The defending party is forced to count only on its own responding actions and so always must be ready to repel a blow.

A special responsibility for high quality in training and indoctrinating personnel rests with the officers, the active conductors of party policy in the Armed Forces. Today they are the organizers and directors of perestroyka among the troops. Its success and the realization of all reserves for improving the system of training soldiers depends to a decisive extent on officers' political maturity, professional level and competence. An officer's personal example in displaying responsibility, businesslike efficiency and principle and his spiritual closeness with subordinates are of inestimable importance.

Mastering the fundamentals of interethnic relations plays an enormous role in the job of indoctrinating servicemen. The sons of all nations and nationalities of our country perform their duty to the Motherland shoulder to shoulder in units and aboard ships. Military service for them becomes a genuine school of internationalism, since the high ideals of friendship and brotherhood of USSR peoples are implemented in the practice of organizational and political work in military collectives.

Firm, conscious military discipline is an integrated qualitative indicator of Armed Forces personnel. It unites their will, gives purpose and cohesiveness to actions, and mobilizes knowledge, energy and initiative for achieving success in military work. It is not by chance that discipline is named first among other military qualities.

At the same time it should be noted that in past years the Army and Navy have been affected by many of the problems mentioned at the April 1985 CPSU Central Committee Plenum, the 27th CPSU Congress and subsequent party Central Committee plenums. These bodies sharply criticized stagnant phenomena in combat and political training of Army and Navy forces and in the indoctrination of command and political cadres. They noted a drop in military discipline of some units and ships and other negative facts. This obligated military councils, political entities, party organizations and officer cadres to draw up and implement a program for a fundamental perestroyka of Army and Navy activity.

The process of perestroyka is developing and deepening in the Armed Forces as it is throughout the country. Its most important objective is to raise the combat readiness of Army and Navy forces to a new and even higher qualitative level. Realization of the demands of perestroyka, which are innovative in their essence, gave rise to positive changes in the work style of commanders, political entities, and party and Komsomol organizations; to a further strengthening of socialist legality and regulation order; and to providing rights and freedoms to the soldier as a Soviet citizen in indivisible unity with the obligations placed on him.

The role of such public institutions as meetings of personnel, NCO's and warrant officers and role of the councils they elect are noticeably growing in the life of military collectives. Invested with the trust of comrades in service, they exert a positive influence on an improvement in the quality of training and on indoctrination of personnel in a spirit of high morality. Many other useful directions in the activation of public activity also were noted.

The CPSU Program emphasizes that the party will bend every effort to see that the USSR Armed Forces are at a level precluding strategic superiority of the forces of imperialism and that the defensive capability of the Soviet state improves. This responds to the tasks of a nationwide campaign to implement the plans of perestroyka and tasks of accelerating our country's socioeconomic development. The creative goals of the party and people wholly rest on reliable armed protection of socialism's achievements.

Utterly dedicated to the Communist Party and Soviet people, Soviet servicemen are making every effort to ensure a further growth in the USSR Armed Forces' combat readiness.

U.S. Armed Forces

18010445b Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 89 (signed to press 10 Jan 89) pp 7-10

[Part One of article by Maj Gen Yu. Omichev]

[Text] The American military-political leadership considers armed forces to be a very important means of achieving its political objectives in the international arena. In the sphere of organizational development of armed forces the United States attempts to have a militaristic machine that would surpass the military capabilities of any potential enemies, and the Soviet Union above all.

According to data of the London Strategic Studies Institute, the U.S. Armed Forces presently are made up of around 3.3 million servicemen (including 2,168,000 in the regular Armed Forces) and up to 1.1 million civilian employees. Counting reserve components and wartime stockpiles, their inventory consists of over 2,000 ICBM's, submarine-launched ballistic missiles, intermediate-range ballistic missiles and ground-launched cruise missiles; around 15,000 tanks; over 16,000 field artillery pieces and mortars; approximately 9,600 aircraft; and over 1,000 ships and auxiliary vessels (of which over 500 are combatant ships).

The U.S. Armed Forces are manned on a volunteer basis. American male and female citizens from 17 to 35 years of age who are fit according to their state of health and physical and mental development are accepted for military service.

After signing a contract and taking the oath, the volunteer is sent to a training subunit to undergo basic military training. Every branch of the Armed Forces has its own training subunits where basic military training and specialty training are carried out. The length of basic military training is seven weeks in the Army, six in the Air Force, seven in the Navy and ten in the Marines. The period of specialty training is from several weeks to a year depending on the chosen specialty.

Military schools of branches of the Armed Forces, courses of civilian military training for reserve officers at civilian higher educational institutions, and officer candidate schools are the principal sources for manning the U.S. Armed Forces with regular officers.

The Armed Forces are divided by administrative organization into three branches—ground forces (Army), Air Force and Navy. The branches of Armed Forces are subdivided in turn into regular troops or naval forces and the organized reserve: the National Guard and Reserve in the Army and Air Force and the Reserve in the Navy. Secretaries and chiefs of staff head up each branch of the Armed Forces (see diagram).

Supreme military command and control entities.[1] Under the Constitution the President is commander in chief of the U.S. Armed Forces. He is given the right to use them in case Congress declares war or when a state of emergency is declared (by the President himself). The President is given the exclusive right to issue the order for employing nuclear weapons.

The President exercises leadership of the Armed Forces through the Secretary of Defense and Chairman of the Joint Chiefs of Staff[2] [JCS] with the immediate participation of the National Security Council [NSC].

The NSC is the President's consultative body for the most important domestic and foreign policy issues. It coordinates and directs the activities of all government agencies in the sphere of military policy and of organizational development and employment of the Armed Forces in the interests of achieving U.S. foreign policy objectives.

The Secretary of Defense is appointed by the President with the consent of the Senate from among civilians for a period of four years. He exercises leadership of the Armed Forces and is responsible for their organizational development, mobilization and combat readiness, combat employment, logistics, and conduct of military research and development. The Secretary of Defense is the President's chief consultant on all military questions and is a member of the NSC. A council on organizational development of the Armed Forces is established under the Secretary. It studies the direction of organizational development and questions of employing the Armed Forces and produces recommendations.

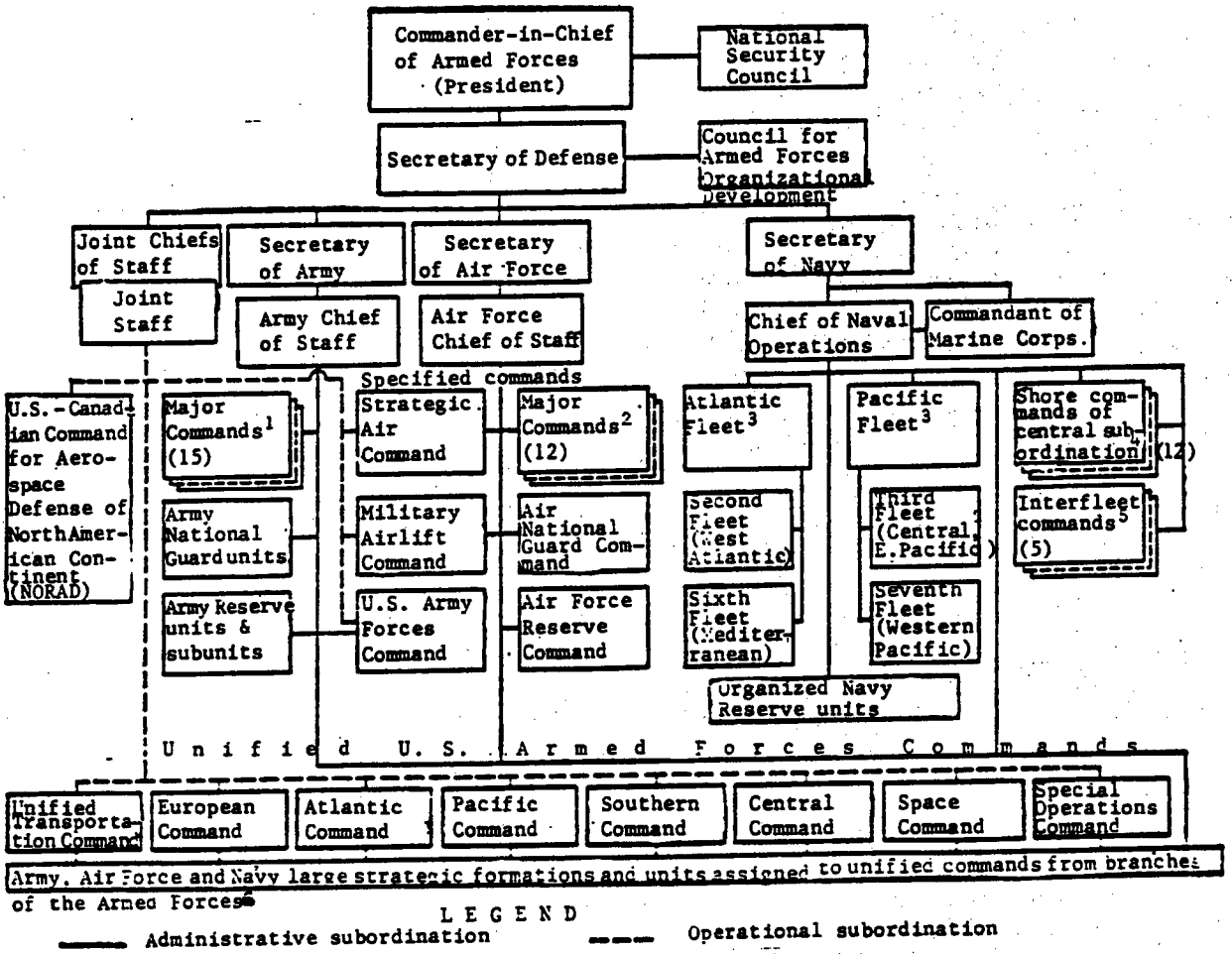
The JCS is the supreme consultative, planning and executive body through which the President and Secretary of Defense exercise operational direction over the Armed Forces. The JCS is headed by a chairman appointed by the President with the consent of the Senate from among generals and admirals of the Armed Forces. He is the chief adviser to the President, the NSC and Secretary of Defense on military matters and has the right to personally make decisions on questions of organizational development and employment of the Armed Forces if the JCS does not succeed in achieving a common opinion on them. The Army and Air Force chiefs of staff, the Chief of Naval Operations and the Commandant of the Marine Corps are members of the JCS.

There is a secretary at the head of each branch of the Armed Forces, appointed by the President with the consent of the Senate from among civilians for a period of four years. He exercises direction over organizational development, manpower acquisition, personnel training, mobilization deployment, outfitting with weapons and military equipment, military research and development, and logistic support of forces through his administrative staff and headquarters staff.

By its organization and outfitting, the **Army** is intended for conducting active combat operations in theaters of war, and in Europe above all, independently or in coordination with the Air Force and Navy, with or without the use of nuclear weapons. It is subdivided into combat arms and services.

The combat arms include units and subunits which execute combat missions (infantry, armor, artillery, special operations forces) or combat support missions (engineer troops, intelligence and electronic warfare units and subunits, signal troops). Army aviation accomplishes both combat and combat support missions. The services include units and subunits performing missions of administrative, logistic and special support (artillery equipment, transportation, finance, medical and so on).

U.S. Armed Forces structure



Key:

1. Army forces in the continental United States, in Europe, in South Korea, in the Pacific, and in Central and South America; Training and Doctrine Command; Materiel Command; Intelligence and Security Command; Military Traffic Management Command; Information Systems Command; Health Services Command; Criminal Investigation Command; Corps of Engineers; Army Strategic Defense Command (space weapons); and Military District of Washington (according to the latest data, one other command, a Space Command, has been established).
2. Strategic Air Command, Military Airlift Command, Tactical Air Command, Space Command, U.S. Air Force Europe, U.S. Air Force Pacific, Alaskan Air Command, Systems Command, Logistics Command, Communications Command, Air Training Command, and Electronic Security Command.
3. The Atlantic and Pacific fleets are operationally subordinate to the unified U.S. Atlantic and Pacific commands respectively.
4. Telecommunications Command; Intelligence Command; Security and Counterintelligence Group Commands; Space Command; Special Operations Forces; Personnel Command; Sea Systems Command; Air Systems Command; Space and Naval Warfare Systems Command; Supply Systems Command; Engineering Command.
5. Test forces, Navy Reserve, Training, Minesweeping, Military Sealift Command.
6. Under the administrative organization, subordinate to the departments and the staffs of corresponding branches of the Armed Forces.

Organizationally the Army is consolidated in major commands (16), army corps (5), airborne corps (1), divisions (28), separate brigades (29), armored cavalry regiments (7), battalions and companies. It also has Special Forces groups (8), field artillery brigades and brigade headquarters (36), and air defense brigades and brigade headquarters (9).

The division is the basic large tactical unit of the Army and includes units and subunits of all combat arms and services. There presently are seven types of divisions in accordance with the Army-90 organizational development program, which is in the final stage: light infantry (5), infantry (6), motorized (1), mechanized (8), armored (6), airborne (1) and air assault (1). Of these, 18 divisions are in the regular Army and 10 are in the National Guard. The numerical strength of a division is 10,000-17,000 depending on its type. The outfitting of divisions with the principal kinds of weapons is given in the table.

Outfitting of Divisions with Principal Kinds of Weapons

Type Division	Tanks	Guns, Launchers and Mortars[1] (Including Atomic Guns)	ATGM[2] Launchers	Air Defense Weapons	Helicopters (Including with ATGM's)
Light infantry	-	179(8)	214	90	96(26)
Infantry	54	209(22)	405	120	218(21)
Motorized	-	135(54)	381	128	125(44)
Mechanized	290	147(72)	336	90	127(44)
Armored	348	147(72)	288	90	127(44)
Airborne	-	195	504	117	132(18)
Air assault	-	159(72)	657	107	438(88)

1. 60-mm and up.
2. TOW and Dragon.

The overall strength of the Army is over 1.5 million persons, including 770,000 in the regular Army. Counting reserve components and wartime stockpiles, their armament consists of 117 Pershing II intermediate-range missile launchers, 50 Lance operational-tactical missile launchers, over 15,000 tanks, up to 16,000 field artillery pieces and mortars, over 17,000 ATGM launchers, 4,500 SAM and portable SAM system launchers, and around 11,000 Army aviation helicopters and aircraft, of which up to 1,500 aircraft are armed with antitank missiles.

According to the American leadership's views, the **Air Force** is the principal striking force both in a nuclear and a conventional war as well as in local conflicts. Having considerable flexibility and high mobility, it is intended for delivering nuclear and conventional strikes to a great depth, winning air superiority, providing air support of ground forces and of naval forces in maritime sectors, conducting aerial reconnaissance, and airlifting troops and cargoes to overseas theaters and within a theater.

The U.S. Air Force includes ICBM's, strategic, tactical and military transport aviation, as well as a number of services (search and rescue, weather and others). Organizationally it consists of air commands (14 major commands, of which 10 are for combat), air armies (17), air divisions (20), air wings (75), and ICBM wings (6). The wing is the principal Air Force fighting unit. The number of aircraft in an air wing varies from 30 to 72 depending on the branch and arm of aviation. An ICBM wing has up to 200 launchers.

The overall strength of the U.S. Air Force counting the organized Reserve is over 760,000 persons. It has 1,000 ICBM launchers, 256 ground-launched cruise missiles and around 5,000 combat aircraft in the inventory.

The **Navy** is a versatile branch of the Armed Forces. It has high mobility, powerful weapons including nuclear weapons, and is intended for conducting combat operations in wars varying in scale and character. The U.S. leadership gives the Navy a special role in carrying out its global policy and in exerting pressure on developing countries by a show of military force and by direct military intervention.

The U.S. Navy includes the fleet, aviation and Marines. They are consolidated in the Atlantic and Pacific fleets, which have submarine, surface, air and Marine forces, as well as shore commands of central subordination and interfleet commands.

The highest operational formation of the U.S. Navy is the operational fleet, which includes task forces of naval arms. The operational fleet is intended for accomplishing missions on a strategic or operational scale in coordination with the Army and Air Force or independently (chiefly within the limits of its zone of responsibility). Two operational fleets (Second and Sixth) and one Marine expeditionary division are formed from the Atlantic Fleet for operations in the Atlantic zone and

Mediterranean, and two operational fleets (Third and Seventh) and two Marine expeditionary divisions (one division is in the naval reserve) are formed for operations in the Pacific zone.

The fighting strength of operational fleets is not fixed and changes depending on the situation and assigned missions. Personnel strength of the Marine expeditionary division is over 50,000. It has in its inventory 70 tanks, up to 270 field artillery pieces and mortars (including 120 guns capable of firing nuclear projectiles), over 430 ATGM launchers (TOW 2 and Dragon), over 350 fighting vehicles and APC's, up to 400 aircraft and helicopters, of which around 100 carry nuclear weapons, and air defense weapons.

Counting the organized reserve, the U.S. Navy has a total of 980,000 persons, around 600 combatant ships and auxiliary vessels (of which around 80 surface combatants and submarines are armed with the Tomahawk cruise missile), and over 3,000 combat aircraft and helicopters, of which around 1,000 aircraft are nuclear weapon platforms.

Along with the administrative organization (by branches of the Armed Forces), there is an operational organization, in accordance with which all forces and assets are consolidated in eight unified and three specified commands. Such commands are established in peacetime for advance elaboration of plans for conducting strategic operations in theaters of war based on accepted military strategy, the existing military-political situation and its possible changes, as well as for unified direction of the groupings of armed forces placed at their disposal.

The direction of forces and assets of unified and specified commands is exercised by their commanders in chief.

(To be concluded.)

Japanese Armed Forces Reserves

18010445c Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 89 (signed to press 10 Jan 89) pp 14-16

[Article by Lt Col A. Rusanov, candidate of military sciences]

[Text] In addition to improving regular forces, in the work of building up the combat might of the Armed Forces the Japanese command gives considerable attention to developing their reserves, which must provide for rapid mobilization deployment and for bringing regular units up to strength in an emergency as well as for making up losses in the initial period of war.

The Japanese Armed Forces Reserves include a standing reserve of branches of the Armed Forces (a first order reserve). Although a second order reserve is not established organizationally, the contingent of persons who have served in the Armed Forces but who are not assigned to the standing reserve and who are not undergoing refresher training is considered a second order reserve. In the assessment of the foreign press, the strength of this contingent, built up only over the last ten years, exceeds a total of 130,000 persons.

The standing reserve of branches of the Armed Forces (established in the Army in 1954, in the Navy in 1970 and in the Air Force in 1986) numbers 46,400 persons, of whom there are 45,000 in the Army, 600 in the Air Force and 800 in the Navy.

The first order reserve is manned by volunteers from among persons who have completed service in the regular Armed Forces (20,000-22,000 persons are released annually). Of these, 8,000-9,000 are assigned to the standing reserve, in which the initial term of service is three years. This is stated in the contract, which can be extended at the reservist's desire. The maximum age for being in the reserve is 37 for privates, 43 for 3d Class NCO's (petty officers 3d Class), and 54 for warrant officers and officers. The percentage makeup of the reserve is 55 percent privates, 40 percent warrant officers and NCO's and 5 percent officers.

Persons registered with the standing reserve must inform the appropriate recruiting-induction station of changes in their residence, about a departure for a period of more than one month, and so on. Since 1987 reservists have been paid a monthly allowance of ¥4,000 (previously it was ¥3,000), and in a period of active duty training they are paid ¥4,700 per day. Release from the standing reserve occurs at the expiration of the contract term, on attainment of maximum age, or for illness.

As a rule, reservists are registered with units stationed near their residence. Reserve personnel are distributed unevenly over the country's territory. The bulk of the reserve (around 80 percent) is located in zones of responsibility of the Eastern, Central and Western armies, where some 90 percent of the country's male population lives. The other reservists are concentrated on what is in the viewpoint of the Japanese command the main northern axis (the islands of Hokkaido and Honshu) and in zones of responsibility of the Northern and Northeastern armies, where over 10 percent of the male population lives.

Such a distribution is the result of a purposeful policy of the Japanese command, which attempts to consolidate potential reservists in given areas. To reach this objective the Japanese command assists former servicemen in finding work.

Reservists' refresher training carried out in a period of active duty training includes weapon and tactical training, studying new weapon and military equipment models, and practicing the procedures and methods of employing them. Reservists are also allowed to be included in exercises of the regular Armed Forces in a period of active duty training. The 1954 Law on the "Self-Defense Forces" provides that active duty training can be conducted once or twice a year and is not to exceed 20 days overall. In practice, however, beginning in 1973 persons released from the Armed Forces no more than a year before undergo one-day training and the others undergo five-day training. During the term indicated in the contract reservists are given the right to take special qualification tests for promotion to the next military rank.

The standing reserve of branches of the Armed Forces can be called up for active military service by order of the chief of the Japanese Defense Agency [JDA] in case a state of emergency arises.

Civil aviation pilots who previously served in the Air Force or who took basic flight training there can be an additional source of Air Force manpower acquisition in a state of emergency. In connection with a shortage of flight personnel in civil aviation, in 1987 the Ministry of Transport and the JDA renewed the practice of placing some military pilots at the disposal of airline companies, a practice which existed from 1962 through 1974. There were 430 pilots transferred during this period. It is assumed that each year 15-30 military pilots over 35 years of age will transfer to civil aviation annually. Basic flight training of civil aviation pilots has been conducted in Air Force training institutions and units since 1962. Some 460 aircraft pilots and 250 helicopter pilots trained there. All necessary expenses were covered by the Ministry of Transport, and the latter also pays the JDA compensation for training pilots who go over to civil aviation (under an appropriate agreement).

The Coast Guard Department is a virtual Navy reserve. It numbers over 12,000 persons: 6,100 who are crews of ships, small combatants, aircraft and helicopters; and 6,000 at shore stations, on staffs and in establishments of the Coast Guard. The Coast Guard Department has some 100 patrol ships (of which 45 are large, including 8 with helicopters aboard), 240 patrol craft and over 180 auxiliary vessels and craft as well as 22 aircraft and 38 helicopters in the inventory.

Coast Guard Department manpower acquisition is by volunteer enlistment. Persons from 18 to 39 years of age who have a secondary education are accepted for service.

In peacetime the Coast Guard Department is subordinate to the Ministry of Transport and performs missions of security and patrol of territorial waters and the 200-nm economic zone, and in a state of emergency it can be transferred to the command authority by decision of the Prime Minister.

In contrast to the standing reserve of branches of the Armed Forces, the Coast Guard Department has its own base for training personnel, which includes a Coast Guard college and school as well as a branch of the Coast Guard school.

The Coast Guard college (city of Kure, Hiroshima Prefecture) was established in 1951 and is intended for training command personnel. Its graduates represent the nucleus of officer cadres. Persons who are accepted there have completed a full secondary school and have successfully passed entrance exams. The period of training is four and a half years. The training program provides for the study of general-science and special disciplines and two foreign languages (the first is English and the second is Russian, Chinese or Korean), a nine-month OJT aboard ships in Japanese coastal waters and one long two-month voyage to the Hawaiian Islands, the U.S. west coast, Australia or New Zealand. Each year 30-35 persons complete the college.

Qualification improvement courses function under the college. They prepare officer candidates (up to 35 persons) from Coast Guard Department personnel. Graduates of the college and the courses are given a diploma of higher education and the qualification of navigator (mechanic) 3d Class or radio operator 1st Class.

The Coast Guard school (city of Maizuru, Kyoto), established in the same year, is intended for training junior specialists of the Coast Guard Department. Persons are accepted here who are no younger than 24, who have completed full secondary school and have successfully passed entrance exams. Training is conducted in six profiles: navigation, mechanics, radio engineering, hydrography, quartermaster service (lasting one year), and lighthouse operation and maintenance (two years). Each year the school prepares some 220 persons, who are given the qualification of navigator (mechanic) 5th Class or radio operator 2d Class.

A branch of the Coast Guard school (city of Kitakyushu, Fukuoka) was established in 1981. It prepares crews and ships of small combatants performing patrol service. The branch accepts persons from 18 to 39 years of age who have the qualification of navigator (mechanic) 5th Class or radio operator 2d Class acquired in the Coast Guard Department, the merchant fleet or the fishing fleet. Training is conducted in three profiles: navigation, mechanics and radio engineering. The term of training is six months. Some 220 persons graduate annually.

In addition, refresher training and qualification advancement of Coast Guard Department personnel are carried out in various Navy short courses.

According to statements by foreign specialists, despite the absence of a law on universal military obligation and a state system of civilian military training of the population and in order to get around the existing Constitution, the Japanese command has created sufficiently

large and well-trained military reserves. In addition, there is a considerable contingent of persons who have served in the Army, Air Force and Navy and there are other additional sources of Armed Forces manpower acquisition in a period of their mobilization deployment. Long-range plans for developing the Japanese Armed Forces provide for a further build-up in the strength of reserve components and an improvement in reservists' professional training.

Strength of Armed Forces of Foreign States

18010445d Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 89 (signed to press 10 Jan 89) pp 16-18

[Reference data by Col G. Petrukhin]

[Text] According to foreign press data, as of the end of 1988 the size of the population and personnel strength of regular armed forces of the states and regimes given below were as follows (in thousands):

Countries	Population	Regular Armed Forces			
		Total	Army	Air Force	Navy
1	2	3	4	5	6
North America					
Canada	25,900	82.3	30	38.3	14
USA	245,300	2,168	770	580.2	780
Western Europe					
Austria	7,590	54.7	50	4.7	-
Belgium	9,870	91	68	18.8	4
UK	56,900	320.7	160	93.4	67.3
Greece	10,000	193.5	150	24	19.5
Denmark	5,100	30	17	6.9	6
Ireland	3,500	13.6	12	0.8	0.8
Spain	39,800	326	230	38.7	47
Italy	57,400	387.5	270	73	44.5
Luxembourg	370	0.8	0.63	-	-
Netherlands	14,600	106.1	68	18	17.1
Norway	4,170	41	24	9.1	7.6
Portugal	10,300	67.8	40	14.5	13.3
FRG	60,900	495	340	110.7	36
France	55,600	461.5	300	95	66.5
Switzerland	6,500	20	16	4	-
Sweden	8,400	66	47	9	10
Asia and Australia					
Bangladesh	107,000	93	82	4	7
Bahrein	460	2.8	2.3	0.2	0.3
Burma	39,300	186	170	9	7
Brunei	250	4	3.2	0.3	0.5
Israel	4,200	172	135	28	9
India	800,300	1,267	1,100	115	52
Indonesia	180,400	293	215	27	43
Jordan	3,700	82.8	75	7.5	0.3
Qatar	320	6	5	0.3	0.7
South Korea	42,900	629	542	33	54
Kuwait	1,800	20.3	16	2.2	0.5
Lebanon	3,300	29	27.5	1.2	0.3
Malaysia	16,600	113	90	12	11
Nepal	17,800	30	30	-	-
United Arab Emirates	1,800	43	40	1.5	1.5
Oman	1,200	21.5	16.5	3	2
Pakistan	104,600	484	450	18	16

Countries	Population	Regular Armed Forces Total	Army	Air Force	Navy
1	2	3	4	5	6
North America					
Saudi Arabia	14,900	72.3	45	16.5	4.5
Singapore	2,600	55.5	45	6	4.5
Thailand	53,900	256	166	48	42
Taiwan	19,600	424	270	77	77
Turkey	52,900	646.4	540	57.4	49
Philippines	61,000	110	65	17	28
Japan	122,100	270	180	45	44
Australia	16,600	70	32	22.5	15.5
New Zealand	3,300	12.8	5.8	4.2	2.6
Africa					
Benin	4,300	4.3	3.8	0.2	0.3
Burkina Faso	8,200	8.7	5.2	0.1	-
Burundi	5,000	9.2	7	0.2	0.1
Gabon	1,100	8.5	1.9	0.6	0.5
Ghana	13,900	10.6	9	0.8	0.8
Djibouti	392	2.8	2.6	0.1	0.1
Egypt	51,900	445	320	105	20
Zaire	32,300	51	22	2.5	1.5
Zambia	7,200	16.2	14	2	-
Cameroon	10,200	11.6	6.6	0.4	0.7
Kenya	22,300	23	19	3	0.7
Ivory Coast	10,700	7.1	5.5	0.9	0.7
Liberia	2,600	6.7	6.3	-	0.4
Mauritania	2,000	12	8	0.3	0.3
Madagascar	10,700	29	20	0.5	0.6
Mali	7,700	10.5	4.6	0.4	-
Morocco	23,300	203.5	150	13	6.5
Niger	6,900	4.1	3.1	0.2	-
Nigeria	108,500	94.5	80	9	5
Ruwanda	6,800	5.2	5	0.2	-
Senegal	7,000	9.7	8.5	0.5	0.7
Sudan	23,500	61	56	3	2
Togo	3,200	4.3	4	0.2	0.1
Tunisia	7,500	42	31	4	4.5
Central African Republic	2,600	3.2	2.8	0.3	-
Republic of South Africa	34,300	103.5	76	13	9
Latin America					
Argentina	32,300	146	93	15	29.3
Bolivia	6,800	28	20	4	4
Brazil	147,000	553	440	50	50.5
Venezuela	19,400	70	55	5	10
Haiti	6,100	7.6	7	0.3	0.3
Guyana	870	5.5	5	0.2	0.3
Guatemala	8,600	50	47.5	1	1.5
Honduras	4,800	22.5	20	2.2	1.2
Dominican Republic	6,900	21	13	4	4
Colombia	30,600	129.3	112	6.4	10.6
Mexico	81,800	129	100	5.5	23.5
Panama	2,200	7.3	6	0.4	0.9

Countries	Population	Total	Regular Armed Forces		
			Army	Air Force	Navy
1	2	3	4	5	6
North America					
Paraguay	4,200	17.5	13	1.5	2.5
Peru	21,300	138	100	15	23
El Salvador	5,200	54.5	50.5	2.5	1
Uruguay	2,900	42.2	35	3	4.2
Chile	12,400	128	84	15	29
Ecuador	11,000	44.5	33	5	4.5

Notes:

1. The Pentagon does not include organized reserves of branches of the armed forces and the National Guard of the United States among regular forces, although in fact they are capable of accomplishing the very same missions (they number almost 1.1 million persons).

2. The column "FRG Army" gives the strength of the Army including ground forces proper (290,000) and territorial troops.

3. Some countries include in the overall strength of armed forces the personnel of strategic nuclear forces, central military establishments and special units as well as the military gendarmerie and military (federal) police, which are not shown by branches of the armed forces.

Ground Forces of NATO Countries in the Central European Sector

18010445e Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 89 (signed to press 10 Jan 89) pp 19-25

[Part One of article by Col V. Kholmov]

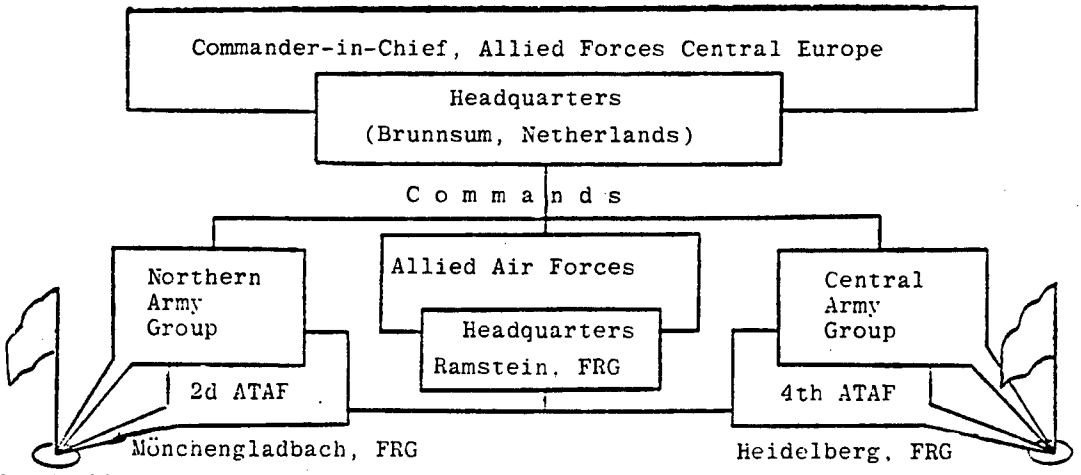
[Text] The concept of reasonable sufficiency for defense advanced by CPSU CC General Secretary M. S. Gorbachev during his visit to France in 1985 and reflected in documents of the 1986 Budapest and 1987 Berlin conferences of the Warsaw Pact Political Consultative Committee (the document "On the Military Doctrine of Warsaw Pact Member States" was signed at the Berlin conference) is evidence of a rational approach to halting the arms race and reducing the armed forces. Despite positive improvements which have been seen in questions of real disarmament, however, the leadership of the United States and NATO is seeking opportunities to "compensate" for the weapon systems being eliminated by building up and modernizing other arms.

General description. As it continues a course toward achieving military superiority over Warsaw Pact countries, the NATO command presently has a large contingent of forces and an arsenal of nuclear weapons. A special place and role in its plans are set aside for the armed forces in Central Europe, the bulk of which are included in the NATO Supreme Command of Allied Forces Central Europe. Its establishment in 1951 was the final step by western powers in deciding to break with allied agreements on Germany and turn the FRG into the primary area for deploying NATO's aggressive forces. "As the geographical center of Europe, West Germany is of great strategic importance for the continent. With West Germany on their side, NATO armed forces will create a strong, continuous front in Central Europe from the Baltic Sea to the Alps," declared D. Eisenhower, the first Supreme Allied Commander Europe and a future U.S. president.

In peacetime the NATO Supreme Command Allied Forces Central Europe is assigned a so-called "zone of responsibility," which according to foreign press announcements takes in the territory of the FRG (less Land Schleswig-Holstein), the Netherlands, Belgium and Luxembourg. NATO strategists also include the territory of France in it, despite France's exit from the bloc military organization in 1966. At the same time, the fact that the "zone of responsibility" includes territories not only of Western European countries, but also of socialist countries including the European part of the Soviet Union, is hushed up in every way in order to conceal the aggressiveness of NATO intentions.

This theater holds a central place in geographic position with respect to the other two European theaters. It stretches approximately 700 km from north to south and is up to 600 km deep in the northern part and to the border with France in the south. A vast coastal lowland is situated in the northern areas of the theater, and medium-size mountains and plateaus with passages and passes leading from FRG territory to the GDR and CSSR borders are in the southern and southeastern areas. Approximately 85 million persons (over 140 million including France) live within the theater, according to western press announcements. The bloc's supreme

Fig. 1. Makeup of coalition command of NATO Allied Forces Central Europe



political and military-political bodies are concentrated here, coalition staffs of NATO Allied Forces in Europe are deployed here, and force groupings of armed forces of the United States, the FRG, Great Britain, Canada, the Netherlands and Belgium as well as France are stationed here, with allied commands established for their direction. The land nature of the theater determines the makeup of allied armed forces in the theater. These are ground forces and allied air forces, which are part of coalition commands (Fig. 1). The ground forces are represented by two army groups (Northern and Central) with a multinational makeup.

The headquarters of Northern Army Group [NORTHAG] was formed in November 1952 and since 1954 has been at Moenchengladbach, FRG. Initially this army group included British, Dutch and Belgian forces and a Canadian mechanized infantry brigade (subsequently transferred to Central Army Group). A West German army corps was included in NORTHAG in 1957. A British general, who usually commands UK ground forces in the FRG, is appointed commander of NORTHAG.

The Americans were at the origin of establishment of the Central Army Group [CENTAG]. Its headquarters and command authority were formed on the basis of American Armed Forces in Europe. French forces became part of CENTAG in 1953 (they were withdrawn in 1966), large West German units were included in it in January 1956, and a Canadian mechanized infantry brigade was included in it in 1970. The location of CENTAG headquarters has changed repeatedly. Until September 1961 it was located in Heidelberg, FRG, then was transferred to Mannheim, and in November 1980 was returned to Heidelberg. The commander, U.S. Army Europe acts as the CENTAG commander.

The foreign press reports that ground forces of the FRG, the Netherlands and Belgium as well as large and small units of the United States, Great Britain and Canada are included in the makeup of the Supreme Command of Allied Forces Central Europe. There are a total of 37 combined-arms formations (23 divisions and 14 brigades), up to 10,000 tanks and 6,000 field artillery pieces. In addition, three French armored divisions are stationed on FRG territory and there are representatives of the French Armed Forces at headquarters of the Supreme Command and army groups.

Theater ground forces are subdivided into regular and territorial forces (FRG, the Netherlands, Belgium) according to specific purpose and missions to be accomplished. In a "period of threat," reinforcing troops redeployed from the United States, Great Britain and Canada can be transferred to the theater command makeup. According to NATO classification, ground forces are divided into "transferred," "assigned" and "earmarked" for transfer to operational subordination of the NATO command. The first category (subordinate to Supreme Allied Command Europe) includes units and subunits performing alert duty (subunits of American Pershing II guided missiles[1] and air defense forces and assets) as well as one West German, Belgian and Luxembourg combat battalion each, which are part of the NATO Mobile Force.

As a rule, large and small units of regular forces are included in the second category. Under day-to-day conditions they are under national subordination and can be resubordinated with the appearance of a state of emergency, for a period of large-scale exercises or in other instances. One army corps each from the FRG, Great Britain, the Netherlands and Belgium is then assigned to NORTHAG, and two American army corps (V and VII), two West German army corps (II and III) and the Canadian mechanized infantry brigade are assigned to CENTAG. Large units (reserve or cadre) belonging to the third category will become part of the theater command on being brought up to strength (or redeployed) and being placed in combat readiness.

The **effective combat strength of the ground forces** is represented by army corps, divisions, separate brigades and regiments (Table 1).

Table 1—Total Number of Army Corps, Divisions, Separate Brigades and Regiments of NATO Ground Forces in the Central European Sector

Countries	Army Corps	Divisions: Mechanized Infantry (Mechanized)	Divisions: Armored (Tank)	Divisions: Airborne (Mountain Infantry)	Brigades	Regiments
United States	2	(2)	2	-	2	2
FRG	3	3	(6)	1(1)	10	13
Great Britain	1	-	3	-	-	2
Netherlands	1	3	-	-	1	-
Belgium	1	2	-	-	-	1
Canada	-	-	-	-	1	-
Total	8	10	11	2	14	18

The army corps is the highest combined-arms operational-tactical unit of national ground forces of NATO countries in the theater. It does not have a strictly defined organizational structure and differs in the number of large and small units included in it. The division is regarded as the principal tactical unit. According to their makeup divisions are divided into mechanized infantry (mechanized in the United States), armored (tank in the FRG), airborne and mountain infantry (both in the FRG) divisions.

The ground forces have separate brigades and regiments for accomplishing specific missions. They are part of the army corps, with the exception of the West German brigades, the Canadian brigade, and regiments.

Organizational structure. Large and small units of the ground forces of different bloc countries in the theater differ in makeup, outfitting and number of arms (Table 2). At the same time, regardless of national subordination and type, all of them have a number of mandatory components inherent to army corps, divisions, brigades and so on. These include the following units and subunits: combat, combat support, logistic support, and other kinds of support (Fig. 2). There also are certain organizational features along with this. For example, while divisions of the FRG, the Netherlands and Belgium include brigades (mechanized infantry and tank) with a permanent makeup, brigades of the American and British divisions are formed depending on the mission assigned, their place in the combat formation and other situational conditions.

Table 2—Principal Arms of Large Units of NATO Ground Forces in the Central European Sector

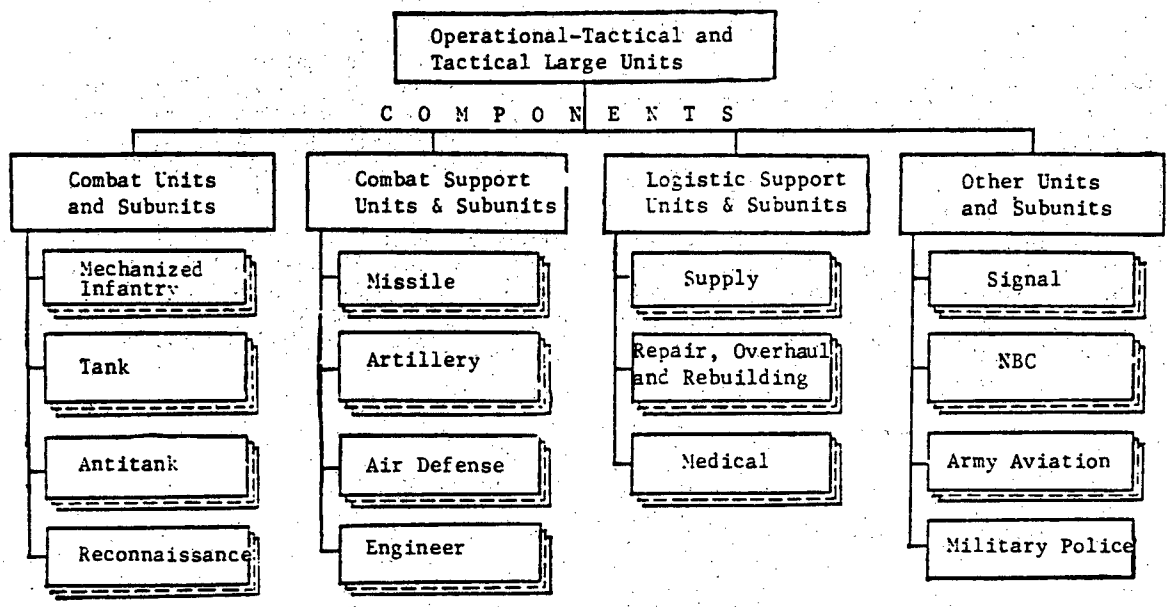
Country	Tanks	Field Artillery: Guns	Mortars	MLRS	ATGM Launchers	Air Defense Weapons: SAM Systems	AAA	APC's, IFV's, CRV's	Helicopters (Including with ATGM's)
Mechanized Infantry and Mechanized Divisions									
FRG	252	90	42	16	189	-	86	434	10(-)
USA	290	72	66	9	336	18	36	736[1]	127(44)
Armored and Tank Divisions									
FRG	308	90	36	16	159	-	86	369	10(-)
USA	348	72	66	9	288	18	36	670[1]	127(44)
UK	325[2]	72	40	-	110	-	-	700	36(24)

1. Including Bradley M2 IFV's and M3 CRV's: 388 in mechanized division; 334 in armored division.
2. Including 285 Chieftain tanks.

Combat units and subunits (mechanized infantry, tank, antitank and reconnaissance battalions, regiments and companies) are intended for immediate conduct of combat operations. The are assigned the mission of defeating and destroying the opposing enemy.

Combat support units and subunits (primarily missile, artillery, air defense and engineer troops) accomplish missions of supporting the combat operations of combined-arms units.

Fig. 2. Block diagram of large unit organizational structure



Logistic support units and subunits are assigned missions of supply, weapon storage and repair, and medical services for troops both in peace and war. Their makeup includes regiments and battalions as well as supply companies, repair, overhaul, and rebuilding companies, and medical companies. The support (logistic) command of army corps and divisions exercises overall direction of these units and subunits and coordination of operations.

Other kinds of support units and subunits include signal, NBC, army aviation, military police, security and other subunits.

Foreign military specialists note that the development and introduction of new weapon systems and military equipment to troops makes it necessary to perfect the organizational structure of large units. The primary objective of measures taken in this area is to increase their striking power and firepower and ensure high battlefield maneuverability and mobility as well as the capability of conducting active combat operations under all conditions.

The long-range Army-90 program is the basis for upgrading the U.S. Army. , The foreign press emphasizes that under this program all large American units stationed in Western Europe should complete the transition to new tables of organization and equipment (the so-called Division-86 or "heavy division") as early as 1990.

The troops' transition to a new structure, Structure-2000, is planned in the Bundeswehr by the mid-1990's. With the retention of three army corps and 12 divisions, it is planned to transfer six brigades of territorial forces to the Army and activate five airmobile brigades.

In the opinion of the British command, the 6th Airmobile Brigade (from the 3d Armored Division) which underwent tests in Great Britain fully justified calculations inasmuch as it combines high antitank capabilities and mobility in a balanced manner. In this regard, judging from western press announcements a decision has been made to form the 2d Mechanized Infantry Division (stationed on the territory of Great Britain) of the 24th Airmobile Brigade on the basis of the 24th Mechanized Infantry Brigade, and the 6th Airmobile Brigade again will become an armored brigade. The primary mission of the brigade being activated will be to combat enemy tanks and armored targets.

It is planned to improve combat capabilities of Dutch and Belgian troops basically by outfitting them with new or modernized models of weapons and military equipment. In addition, the question is being considered of redeploying the headquarters of the Dutch 4th Mechanized Infantry Division to FRG territory, where there is already one brigade from the division and a separate reconnaissance battalion.

Principal armament. Attaching great significance to improving the combat capabilities of ground forces, the NATO military leadership is striving to outfit them with modern armament. During fulfillment of a long-range military program, bloc countries are working to modernize obsolete equipment and introduce weapon systems to the troops which meet demands of conducting active combat operations.

Tank inventory. The NATO command views modern tanks, which combine firepower, armor protection, high mobility, maneuverability and off-road capability, as the principal striking element of large combined-arms units. Tanks produced in the 1980's (the American M1

Abrams, West German Leopard 2, British Challenger) and those adopted during the 1960's and early 1970's (M60, Leopard 1, Chieftain) are the basis of the ground forces' tank inventory in the Central European sector. West German tanks account for the greatest proportion and are used to outfit troops of the FRG, the Netherlands, Belgium and Canada. American and British forces have tanks of their own production. In addition, the inventory of the FRG territorial troops contains around 700 American M48 tanks, which have been modernized and have been brought close to the capabilities of tanks of the 1960's-1970's in their indicators, and there are Scorpion light tanks in reconnaissance subunits of large British and Belgian units.

The foreign press notes that the tank inventory is being renewed by introducing new tank models to the troops as well as by modernizing those in the inventory. For example, a planned program has been fulfilled in the FRG for producing 1,800 Leopard 2 tanks for the Bundeswehr. As planned, they were used to bring 14 tank brigades of divisions up to strength. Up to 450 of these tanks were sold to the Netherlands. A decision was made in 1988 to replace Leopard 1A4 tanks of the 10th Tank Division (not envisaged under the initial plan), for which an additional 250 Leopard 2 tanks were to be delivered to the troops. In the British Army it is planned to upgrade and replace half of the tank inventory with Challenger tanks before the end of the 1980's and replace the remaining Chieftain tanks with new models expected to come into the inventory in the latter half of the 1990's. Under the Army-90 program the tank inventory in large units of American forces in the FRG will consist fully of the M1 Abrams tank and its modernized versions.

But creating new tanks requires much time and money. For example, it took some ten years to develop the Leopard 1, Chieftain and M60A1 tanks. Meanwhile, the modernization and constant technical upgrading of these models permit improving and maintaining their capabilities in relatively short time periods and with rather limited expenditures in accordance with growing demands. For example, the West German Leopard 1 tank put out in 1965 underwent a number of modernizations in the 1970's. As a result, its various upgraded versions (Leopard 1A1, 1A2, 1A3, 1A4) became operational and remain in the inventory. At the present time the FRG is working to modernize the Leopard 1A1 tank in the 1A5 version. Similar measures are being taken with American and British tanks, also including the new models. In particular, during upgrading of the M1 Abrams tank the 105-mm gun is being replaced by a smoothbore 120-mm gun. The first models of these tanks, designated M1A1 Abrams, have been entering service with the U.S. and FRG ground forces beginning in 1986.

Field artillery. The principal field artillery pieces of theater ground forces are the 155-mm and 203.2-mm self-propelled howitzers (M109A2 and A3 and the M110A2), which have undergone modernization, as well as the FH-70 155-mm towed howitzers (jointly produced by Great Britain, the FRG and Italy). In their technical capabilities they provide for conducting fire to a maximum range of 30 km. The M712 Copperhead 155-mm guided projectile, intended for engaging armored targets at distances up to 16 km (hit probability over 0.5), entered service with American forces in the early 1980's. Two such projectiles each are part of the unit of fire of M109A2 howitzers.

Multiple rocket launchers supplement the firepower of ground forces. They are represented by the American MLRS (maximum range of fire up to 40 km) and the West German LARS (around 15 km). The American MLRS is considered the most promising. In the near term (late 1980's-early 1990's) it is planned to make them operational with ground forces of practically all NATO Western European countries.

The principal calibers of mortars with which troops are equipped are 81, 106.7 and 120 mm. Lately 51-mm and 60-mm mortars have been seeing more and more development. Rounds with increased effectiveness against the target which have been developed for them bring them to the level of 81-mm mortars with considerably lesser weight when deployed.

The SADARM antitank cluster projectile, which meets the "fire and forget" principle, is a relatively new munition for field artillery. The first such model was the American 203.2-mm projectile. A similar munition for the 155-mm howitzers and MLRS is being developed in the United States and FRG. Guided 81-mm and 120-mm mortar rounds are being created at the same time.

Antitank missile systems are intended for engaging enemy armored targets on the battlefield. With small overall dimensions, they have a sufficient maximum range of fire (up to 4,000 m), high target hit probability (0.7-0.8) and considerable armor penetration (500-700 mm). Antitank missile systems presently in the inventory of ground forces of NATO countries in the Central European sector belong to the so-called second generation (the ATGM's have a semiautomatic guidance system). The principal ones are the TOW (in the inventory of ground forces of the United States, the FRG, the Netherlands and Canada), HOT (FRG), Milan (FRG, Great Britain and Belgium) and Dragon (United States and the Netherlands). The TOW 2, HOT 2 and Milan 2 ATGM's were created and became operational as a result of work done to upgrade these systems in the late 1970's and early 1980's. They are equipped with thermal imaging sights and are intended for firing under nighttime conditions. Swingfire ATGM's remain in the inventory of large British and Belgian units.

The principal special self-propelled launchers are the West German Jaguar 1 with the HOT ATGM and Jaguar 2 with the TOW ATGM, the American M901 with the TOW ATGM, and British Striker with the Swingfire ATGM (produced with the Milan ATGM beginning in

1986). A trend has been seen at the same time for installing ATGM's on fighting vehicles intended for transporting personnel. For example, the M2 Bradley IFV and M3 combat reconnaissance vehicle with two-rail launchers for the TOW ATGM became operational with American forces. After modernization of the Marder IFV in the FRG it is planned to accommodate the portable Milan antitank missile system on the vehicle hull.

In the assessment of western specialists, the helicopter is the most effective antitank weapon. Fire support helicopters are used for this purpose in the American forces. One of them is the AH-64A Apache, capable of carrying up to 16 Hellfire ATGM's (range of fire 6,000 m). Similar models of combat helicopters are in the inventory of ground forces of the FRG (BO-105P) and Great Britain (WG-13 Lynx).

Close coordination of tanks with mechanized infantry subunits assumes special significance in modern combat. Because of this, bloc countries give special attention to upgrading and further developing *armored vehicles* for delivering personnel to the battlefield. They are represented by APC's and IFV's.

The majority of types of APC's in the ground forces of NATO countries in the Central European sector were developed during the 1960's and 1970's. The most widespread of them is the American M113 APC, which has undergone a number of modernizations over the years of its existence. West German (Fuchs) and British (Trojan, Spartan, Saxon) models and certain others also are in the inventory of units and subunits. Western specialists are of the opinion that APC's do not fully meet modern demands. Therefore at the threshold between the 1970's and 1980's emphasis was placed on outfitting troops with infantry fighting vehicles having high off-road capability and sufficient firepower and protection and capable of conducting combat operations in combat formations with tanks. As a result the M2 Bradley (USA), MCV-80 Warrior (UK) and YPR-765 (Netherlands) IFV's became operational and the West German Marder IFV underwent modernization and upgrading. In contrast to APC's, all IFV's have tracked propulsion. In addition to machinegun armament, 20-mm to 30-mm automatic guns are installed on them, which considerably increased their capabilities of engaging enemy armored and other targets and led to a change in views on subunit operating tactics.

(To be concluded.)

Footnotes

1. In accordance with the INF Treaty between the USSR and United States, Pershing II missiles will be dismantled and removed from the FRG and then destroyed—Ed.

Improving Tank Survivability

18010445f Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 89 (signed to press 10 Jan 89) pp 25-32

[Article by Col B. Safonov, candidate of technical sciences]

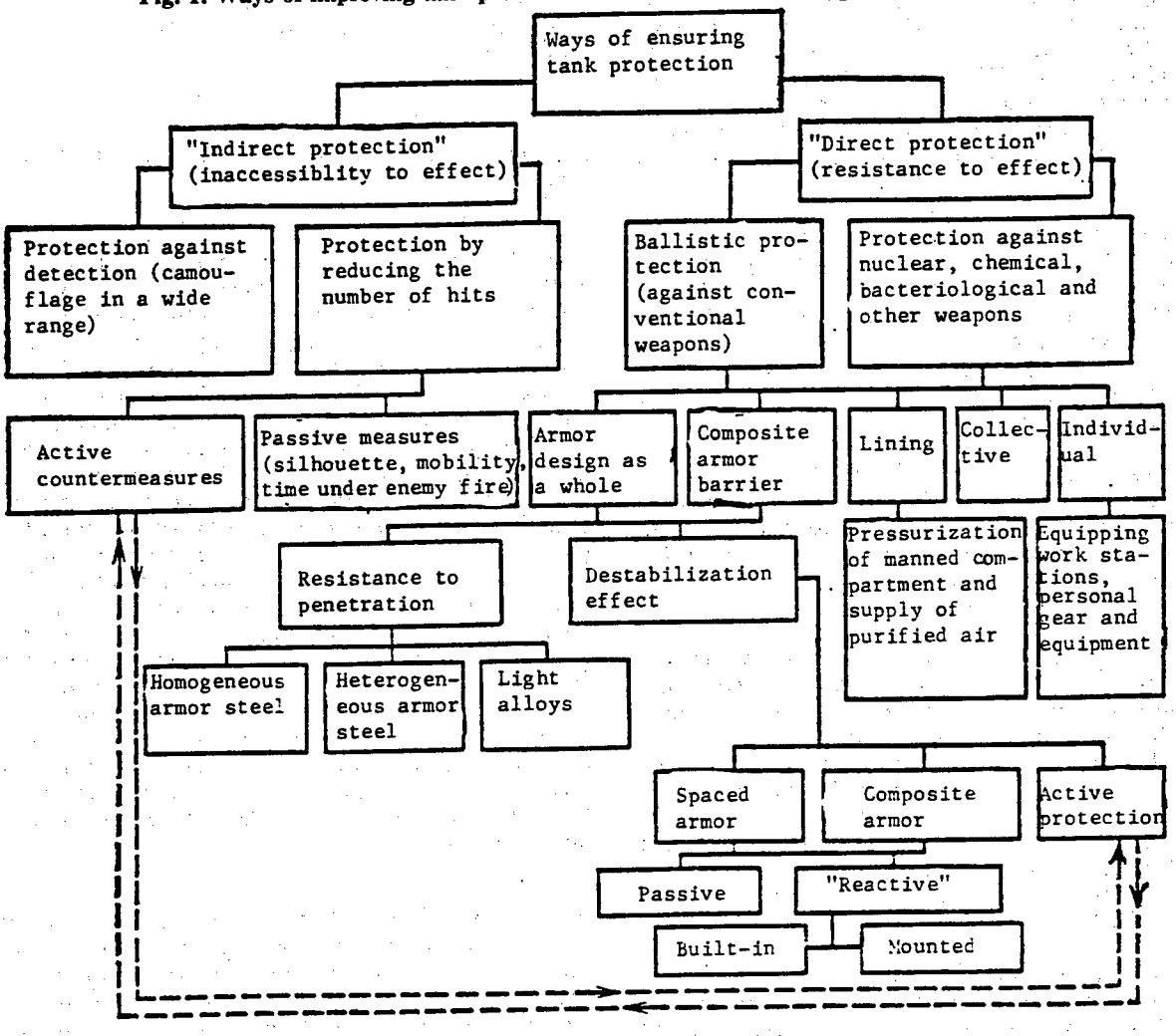
[Text] One of the key tasks in developing the weapons and combat equipment of ground forces of capitalist countries is the problem of ensuring their survivability, i.e., the feature of preserving and rapidly restoring their combat effectiveness under enemy pressure. This is dictated by the swift development of various weapons in recent years. The upgrading of nuclear weapons, their extension to the tactical level, and the quantitative and qualitative growth of conventional weapons, with many of their models assuming a clear-cut antitank direction, considerably complicated searches for ways to solve this problem. Tanks traditionally are the most stable to the effects of all weapons, including nuclear weapons. Foreign specialists note that the development of armament systems of ground forces occurs along two parallel directions which sharply rival each other: on the one hand, it is the development and upgrading of tanks and other armored equipment, as a result of which essentially all combat arms of ground forces are shifting to self-propelled armored vehicles and systems; on the other hand, it is an improvement in existing weapons and creation of fundamentally new and more effective means of destroying armored objects.

It is thought that the probability of hitting a modern tank with a single round from a tank gun or antitank guided missile [ATGM] system is four times higher than was the case in the early 1950's, and double that of the late 1960's. The antitank weapons presently being created are an even greater danger to a tank. Their characteristic feature is the fact that they are developed as systems which include equipment for long-range detection of force groupings, for automatic calculation of target allocation, and for delivery of warheads; and new types of warheads themselves. These systems are intended for engaging not lone targets, but entire tank subunits. Warhead submunitions act on armored objects from their least protected direction—from above.

The capabilities of tube and rocket artillery, tactical and army aviation, and engineer troops for engaging tanks have increased sharply.

All this leads to the fact that conditions of tank combat employment are becoming more and more complex. The appreciable increase in demands for survivability of new models which may appear in the 1990's as well as the increased amount of work done to modernize already

Fig. 1. Ways of improving tank protection with the aim of ensuring their survivability



existing armored equipment aimed at improving its protection and restorability attests to the fixed attention being given abroad to a solution to this problem.

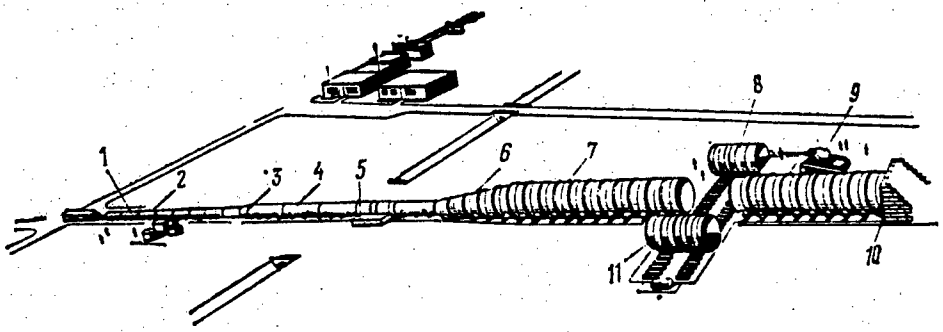
The difficulty of solving the problem of ensuring the necessary level of tank survivability is dictated not only by the swift development of weapons, but also by the very rigid weight-size limitations being imposed on the design of armored equipment models. There is no one path or method whose practical realization would lead at the least to a decrease in the problem's acuteness if not to its solution. Therefore foreign specialists in the sphere of tank building are striving to increase tank survivability by a comprehensive approach and by using different directions for improving the design of models (Fig. 1).

Directions for increasing the protection of models customarily are divided conditionally into two main ones—"direct" and "indirect" protection. The first involves increasing the resistance and protective properties of the model against the effect both of hits by submunitions (projectiles, fragments, warheads and so on) as well as of damage-producing elements of nuclear, chemical, bacteriological and other weapons. The second direction pursues the objective of using all accessible design measures, procedures and methods, including those carried out by the crew, to reduce the armored object's accessibility to the effect of weapons and to reduce the probability of hits by various types of submunitions.

Such a subdivision is legitimate with respect to protection both against conventional weapons and against weapons of mass destruction. Foreign specialists emphasize that measures to ensure protection against different weapons must be mutually tied together and be carried out in an integrated manner.

The nuclear weapon is the most important kind of weapon of mass destruction. Its damage-producing elements are the air blast wave, thermal radiation, penetrating radiation and electromagnetic pulse. Radioactive

Fig. 2. General view of blast tunnel installed at the test center in the city of Fulness (UK)



Key:
1. Propellant chamber
2. Pipe with inner diameter of 1.8 m and length of 36 m
3. Short expansion cone
4. Pipe 2.4 m in diameter and 42 m long
5. Section for testing buried constructions
6. Asymmetrical expansion cone
7. Pipe 4.9 m in diameter and 66 m long
8. Main test section
9. Tank before installation in test section
10. Air slot 1.4 m wide
11. Ports for photography and filming

contamination of the terrain as well as various accompanying phenomena (conflagrations, structural rubble, inundations and so on) capable of exerting substantial influence on the conduct of combat operations and troop losses can occur as a result of the use of nuclear weapons.

Since the effect of a nuclear burst's damage-producing elements on the armored object and on its crew varies, in formulating demands for tank protection one usually proceeds from the assumption that under all conditions in which the crew can survive, the vehicle also has to "survive" (retain combat effectiveness). With this approach, system survivability usually is determined by the degree of a person's vulnerability.

Depending on conditions, the air blast wave can inflict damage of varying seriousness on any armored object including a tank right up to its complete destruction and death of the crew. The result of the blast wave's effect is determined by values of its basic parameters—overpressure at the blast wave shock front, dynamic pressure, and duration of the compression phase. The tank sustains damage from external equipment breaking off and being disabled, from the fogging or destruction of inlet windows of observation devices, and from the deformation of the hull roof plate and hull floor. The armored object can be overturned, thrown back, or covered by earth and its crew can be injured by a leaking blast wave, by noises generated inside the armor, and by objects ripped from the armor. People can receive serious injuries from hitting protective structures.

The tank's necessary level of resistance and protective properties against the blast wave effect is achieved in foreign tank building by ensuring the strength, rigidity and airtightness of construction of the vehicle hull and turret, reliable attachment of instruments and machine units, and compliance with specially stipulated conditions for crew accommodation.

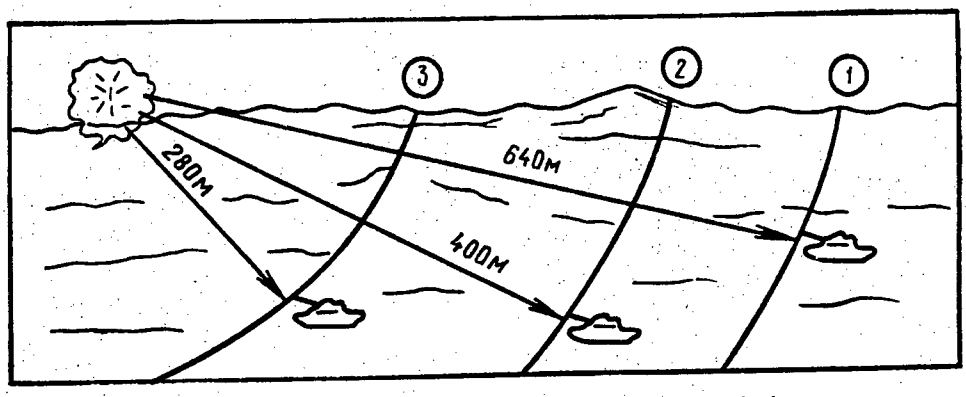
In the design stage the level of resistance of an armored object's design to blast wave effect is determined by calculation methods. Prototypes and preseries and series models are studied in special blast tunnels (Fig. 2), and sometimes also during full-scale testing. The effect of the blast wave not only of a nuclear burst, but also of that obtained from the explosion of a conventional weapon (fuel-air explosives, powerful fougasses and so on) is checked in the process.

The thermal radiation of a nuclear burst can cause thermal damage to instruments, ignition of some materials, and temporary or permanent blinding of crew members.

Foreign specialists recognize the latter as the most dangerous with respect to tanks, inasmuch as under some conditions the radii of the thermal radiation's lethal area can be considerably larger than those from the blast wave and penetrating radiation.

With regard to protective measures, it is deemed advisable to use electromechanical shutters on observation devices, to use photochrome optics (they change optical

Fig. 3. Radii of lethal areas from the explosion of a 1 KT neutron weapon for tanks having a differing level of antiradiation protection



Key:
1. Tank with monolithic steel armor 100 mm thick. At this distance from the explosion, overpressure at the front of the blast wave P_{Φ}=0.28 kg/cm^2. The radiation attenuation ratio is 2.8.
2. Tank with Chobham composite armor with an overall thickness of 200 mm. P_{Φ}=0.56 kg/cm^2, radiation attenuation ratio 12
3. Tank with advanced composite armor with an overall thickness of 300 mm. P_{Φ}=1.2 kg/cm^2, radiation attenuation ratio 35

density under the effect of light), and to make a gradual transition from direct observation of the battlefield to indirect observation through electro-optical television and thermal imaging devices, with images transmitted to crew member monitors (screens). It is emphasized, however, that the quality of the image received, and particularly its two-dimensionality, presently does not fully meet the levied requirements.

Penetrating radiation of the nuclear burst, containing gamma radiation and a neutron flux, can have an unfavorable effect on the armored object's crew and electronics. The problem of protecting tank crews against penetrating radiation acquired special urgency after the appearance of neutron weapons, i.e., weapons with an increased output of initial radiation. Damage to the electronics of modern tanks can be irreversible or reversible. The effect of penetrating radiation on a crew is considered very dangerous. American specialists take 30 hectorads (3,000 rads) to be the maximum permissible exposure within a tank with a 2.5:1 dose ratio of neutron flux and gamma radiation. On receiving such a dose, a crew loses combat effectiveness an hour after exposure.

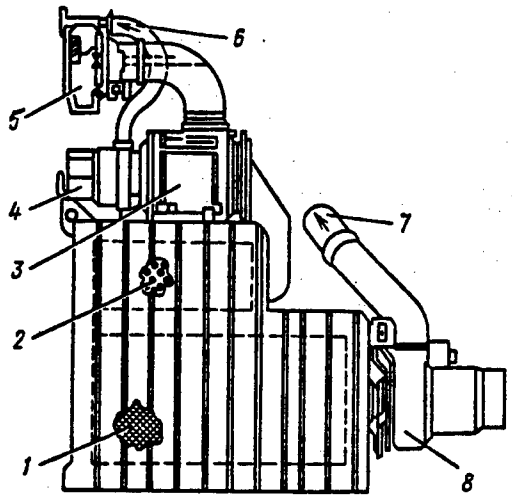
The principal direction for increasing antiradiation protection of tanks is the creation and use of materials having a low transmission coefficient for radioactive emissions. These materials include hydrogen-containing polymers with boron or lithium additives in particular and can be used in the form of external or internal surfaces (overlining and underlining) or can be accommodated between armor plates. According to foreign press data, the transition from monolithic steel armor 100 mm thick typical of tanks of the 1950's to composite armor containing special absorbing materials and with an overall thickness of 300 mm (which can be considered realistic for tanks of the early 1990's) will permit considerably improving the crew's antiradiation protection (Fig. 3).

Foreign specialists emphasize, however, that in practice serious weight-size and configuration limitations are being encountered in carrying out measures for strengthening the antiradiation protection of tanks. In addition, the actual protection level is reduced as a result of the presence of numerous weakened zones such as hatches, observation devices and so on in the design of hulls and turrets of armored objects.

Levels of protection against penetrating radiation of the nuclear burst as well as of radioactively contaminated terrain essentially have been achieved in the tank design and are being tested during special tests using nuclear reactors. For example, during development of the American M1 Abrams tank prototypes were tested for the effect of the dose rate and full dose of gamma radiation under near-real conditions. Tests for the effect of a neutron flux were carried out at the White Sands missile range, with conditions typical of a nuclear burst simulated.

The electromagnetic pulse arising during a nuclear burst can seriously affect the working capacity of electronics. This manifests itself in the fact that currents which considerably surpass permissible currents are induced in electronics through antennas and are capable of causing reversible and irreversible damage in it. Among the principal measures of protection against electromagnetic pulse, western specialists include the use of circuits stable to electromagnetic interference, the use of electronic elements stable to electromagnetic pulse, and the shielding of individual devices or entire electronic systems.

Fig. 4. Leopard 2 tank air filtration and ventilation unit



Key:
1. Gas filter
2. Fine dust filter
3. Coarse filter
4. Dust ejection fan
5. Outside air intake opening
6. Dust ejection pipe
7. Line for supplying purified air to fighting compartment
8. Purified air supply blower

Modern foreign tanks are equipped with air filtration and ventilation units supplying purified air to the airtight behind-armor space of an armored object's manned compartments or directly to crew members' respiration zones. Ordinarily the air filtration and ventilation unit consists of a centrifugal fan (blower), special filters, air ducts, control system, control and shut-off fixtures, and monitoring-measuring instruments (Fig. 4). The presence of a set of filters, usually replaceable from the outside of the vehicle, permits using the air filtration and ventilation unit for protection not only against radioactive dust, but also against biological and toxic chemical agents.

Thus in the opinion of western specialists, by virtue of their design features tanks have considerably higher protective properties with respect to weapons of mass destruction compared with other models of ground forces' weapons and combat equipment. The problem of further upgrading armored equipment protection remains very pressing, however, in connection with the continuous development of these weapons as well as the development of new kinds of weapons based on previously unused physical principles.

In order to fulfill the "indirect" protection of tanks against nuclear, chemical and bacteriological weapons it is considered important to carry out a set of special measures aimed at reducing the likelihood of the enemy's use of these weapons against troop subunits and units (operational camouflage, concealment and deception [CC&D]; secrecy of concentration; operations in dispersed formations; active countermeasures against reconnaissance assets and so on).

With respect to conventional weapons, specialists single out four basic directions in the development of "indirect" protection (see Fig. 1): using CC&D in a broad range (in the visible, infrared, radar and other regions of the spectrum); reducing the dimensions of an armored object as a target; reducing the probability of its being hit by ammunition by increasing its mobility and reducing the time it is under fire; and using active countermeasures against the enemy.

The CC&D of tanks, as well as of other models of weapons and combat equipment, is accomplished by using special paint to resemble the average terrain background or as contrasting spots of varying color which distort an object's typical revealing signs (camouflage paint), and by using authorized camouflage kits, radio-absorbing and heat-insulating coatings, and improvised means. They are mixed with ambient air to reduce thermal contrast created by hot exhaust gases. More and more attention is being given to smoke-producing compounds—artificial aerosols—as a CC&D asset. Higher demands lately have begun to be placed on these assets (which saw appreciable development from the mid-1970's) with respect to toxicity, length of storage, environmental effect and so on, dictated by the need for their use for training and drill purposes.

The traditionally used smoke-producing assets based on white and red phosphorus, hexachloroethane, and petroleum vapors serve for CC&D in the visible and near-infrared regions of the spectrum to a wavelength of approximately 1.2 microns. At the present time, however, infrared instruments are used for reconnoitering targets which operate not only in the near, but also in the far (8-14 micron) region. This dictated the use of aerosols of hard particles. Western specialists note that such aerosols permit carrying out rapid, effective CC&D of armored objects, but their shortcoming is the inability of hard particles to combine with air moisture, which intensifies the effect of smoke formation. Therefore smoke screens that have formed disperse rather quickly and lose their effectiveness, especially with a strong wind. M76 smoke grenades for camouflaging tanks in the visible and infrared bands have been series-produced in the United States since 1985. Similar smoke equipment also is produced in the FRG.

In connection with the possibility of integrated use of reconnaissance assets operating in the visible, infrared and radar regions of the spectrum, measures are being taken abroad for further upgrading aerosols with the objective of extending their concealing properties also to the radar region of electromagnetic radiation.

The dimensions of the tank as a target have a substantial effect on the probability of it being hit by projectiles, and so persistent searches are being carried out abroad for ways to reduce these dimensions. This is connected with a reduction in crew size, the use of compact or small machine units and assemblies, and realization of new configuration solutions. It is believed that a considerable reduction of frontal projection can be achieved by rejecting the traditional turret and accommodating the main armament on a lifting and rotating carriage.

The foreign press stresses that if a vehicle has a low silhouette and high mobility indicators, and above all maneuverability, i.e., the capability of quickly changing speed in direction and magnitude, it will be able to take considerably better advantage of the terrain's protective properties. The time it is on the battlefield under enemy fire increases as a result. Design elements supporting tank mobility are being upgraded with consideration of this. A high weight-horsepower ratio, a hydromechanical transmission with hydraulic-displacement transfer in the traverse drive and a hydraulic retarder, and individual torsion-bar suspension with friction shock absorbers, for example, permit the West German Leopard 2 tank to accelerate from in place to a speed of 32 km/hr in six seconds, stop in 3.6 seconds while moving at a speed of 68 km/hr, smoothly "enter" into turns with varying radii, and move at high speed over difficult washboard routes.

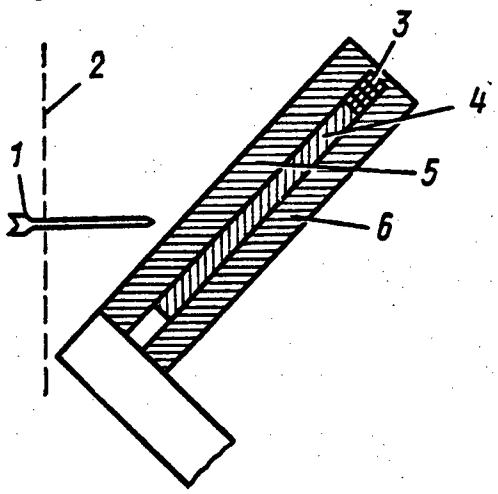
Other modern tanks possess approximately the very same mobility indicators. This enables vehicle crews to conduct fire from the most favorable and at least partially concealed firing positions and rapidly displace from one to another.

Western specialists consider the development and use of so-called active protection systems to be a promising direction for improving tank protection against modern antitank weapons. The idea of such protection consists of using some method to affect a projectile fired at a tank in order to change its trajectory, hinder a hit on the target, and sharply reduce the effectiveness of its action.

In practice the idea of active protection is realized in three directions. It consists first of all of creating a hindrance for an operator conducting fire and for the missile or projectile guidance system; secondly, leading off guided (including homing) projectiles using rapidly placed decoys; and finally, affecting a projectile flying toward the tank for the purpose of destroying it. Foreign specialists emphasize, however, that despite the technical feasibility of developments in those directions, there are many difficulties in creating active protection systems, and their use places certain restrictions on combat tactics.

All "indirect" protection measures are being carried out together with an improvement in vehicle design in the direction of increasing the resistance of their armor to the effect of projectile hits ("direct" protection). The most promising from this standpoint are considered to be a further improvement in armor design and rationalization of configuration, as well as the use of special systems reducing the behind-armor effect of projectiles, and use of protective clothing for the crew.

Fig. 5. Variant of built-in dynamic protection



Key:
1. Projectile
2. Contact grid or arming shield
3. Explosive charge
4. Moving armor plate
5. Fixed armor plate
6. Fixed armor plate

An improvement in the armor construction's resistance to artillery projectiles is linked with the use of new metallic and nonmetallic materials obtained on the basis of modern technologies, and with the further development of designs of armor barriers, particularly composite armor. An attempt is made in practice to use those designs which do not simply give passive resistance to a penetrating body (the core of a subcaliber projectile, a shaped-charge jet and so on), but which destabilize it and give rise to a higher energy expenditure.

One method of achieving this is to use explosive charges in the construction of composite armor. This method has been called "dynamic protection" (sometimes the term "reactive" armor is encountered). Elements of dynamic protection can be mounted on the outside of a tank, as was the case on Israeli tanks in the summer of 1982 during the aggression in Lebanon (see color insert [color insert not reproduced]), or between armor plates. The design both of the elements themselves and of the entire barrier can vary. One version of "dynamic protection" is shown in Fig. 5.

Such protection is triggered when a projectile (1) passes through a contact grid or arming shield (2). In the process the explosive charge (3) is detonated, as a result

of which the moving plate (4) displaces relative to the fixed armor plates (5 and 6). The system for initiating detonation of the charge must be calculated so as to ensure that the penetrating projectile or jet definitely encounters the moving plate. In the opinion of foreign specialists, the described design has such advantages as effectiveness against conventional armor-piercing projectiles and insensitivity to a change in the angle of impact of projectile with armor. It is also important that plate movement not increase barrier thickness, and that the moving plate's impulse never be directed along a normal to the barrier surface.

Searches are under way for other methods of affecting a projectile which has hit a tank. For example, the United States has developed a variant for decreasing the penetrating power of projectiles and bullets by increasing the brittleness of their head surface. This is achieved by including a liquid reagent—an alloy of mercury with sodium, potassium or lithium—in the front surface of a composite armor barrier. As a result of the amalgam's effect on the projectile, its surface instantaneously becomes brittle and disintegrates on impacting the last armor layers.

In the opinion of foreign specialists, "dynamic protection" can provide a significant improvement in the resistance of armored objects to the effect of different types of projectiles. They note, however, that the use of explosives as part of armor protection requires consideration of a number of accompanying circumstances. Above all, the effect of the flat element of "dynamic protection" on the armor on which it is situated in principle is similar to the effect of an armorpiercing-HE projectile with mushrooming head and plastic explosives (around half of the released energy in the detonation affects the armor). This hampers the use of "dynamic protection" on tank armor of small thickness, particularly on the hull roof plate. Additional design measures taken lead to a considerable complication of protection and an increase in vehicle size and weight.

In addition, expenditure of elements of "dynamic protection" during combat leads to a reduction in the armored object's overall protection. Therefore a demand placed on the design of such protection is for the possibility of replacing the elements (desirably by crew efforts).

Western specialists emphasize that they still have far from exhausted reserves for upgrading armor designs by traditional methods—by improving the makeup of composite armor and properties of materials being used, by choosing more expedient shapes of armored parts of the hull and turret, and by directly increasing the thickness of the most important sections by using additional armoring.

For example, the United States has been producing modernized M1A1 Abrams tanks since the middle of 1988. Their armor protection was reinforced by using depleted uranium in it. Such a technical solution is fundamentally new. It is known that depleted uranium is not only very heavy (approximately 2.5 times heavier than steel), but also a costly material. In addition, it has natural radioactivity, which introduces specific features to the organization of tank production. Meanwhile it is considered that the use of depleted uranium in a tank's armor protection (on condition of assuring a level of natural radioactivity safe for crew members) will considerably improve its survivability on the battlefield.

One widespread method for reinforcing armor protection for tanks already with the troops is the use of additional armoring. The Stillbrew mounted composite armor is installed on frontal portions of the hull and turret of the British Chieftain during major overhaul (Fig. 6) [figure not reproduced]).

Much attention has been given abroad in recent years to the use of reinforced plastics in fighting vehicle designs. It is deemed advisable to use them as a component of composite armor.

In the opinion of foreign specialists, an important aspect of using glass-reinforced plastics is the creation of transparent armor blocks on their basis, giving fighting vehicle crews an opportunity to observe the battlefield. Work done in the United States has shown that an observation block of glass-reinforced plastic, having considerably greater resistance to small arms fire and shell fragments compared with a block of conventional bulletproof glass, can have 10-15 percent less weight and approximately 20 percent better light transmission.

Tank survivability is determined to a considerable extent by their design, which gives the crew an opportunity to survive and retain combat effectiveness under conditions of enemy pressure. One configuration solution aimed at achieving that objective is to remove ammunition and fuel, which present the greatest danger to the crew in case the armor is penetrated, out of the manned compartment. This can be done by accommodating them in peripheral areas of the behind-armor volume and using armor partitions.

The highest level of crew protection can be achieved in realizing new configurations, particularly with the crew's compact accommodation in a small, well protected compartment (capsule). In this case the problem of protection not only against conventional projectiles by means of reliable armoring, but also against weapons of mass destruction by sealing the manned compartment, covered inside by absorbing materials, and supplying purified air to it, is solved considerably more simply than with the traditional configuration.

The use of a skin on manned compartments (an underlining against shell fragments) and use of protective clothing can make a substantial contribution to tank crew protection. Kevlar, which retains stability of mechanical characteristics in a wide range of temperatures, is becoming more and more widespread as the primary material for this purpose. With low density (1.44 g/cm^3), its fiber has a very high breaking strength (2,760 newtons/mm^2), which permits obtaining good ballistic resistance of barriers made of several layers of fabric—it can be 2-3 times higher than with the use of

other synthetic fibers. The advantages of Kevlar also include its corrosion resistance, incombustibility, and low sensitivity to the majority of chemically active substances.

Armored vests of Kevlar fabric for tankers usually differ from infantry vests by their cut. As a rule they have pockets for inserting additional armor sheets (metallic, ceramic, or of rigid types of Kevlar) and greater weight. The helmet is an important protective element of clothing. It has to protect the tanker's head against shell fragments and the casualty-producing factors of nuclear and chemical weapons as well as against noise and mechanical injuries from impacting protective constructions. The helmet must provide an opportunity of communicating with other crew members and operating the radio.

Work is under way to upgrade other clothing elements. For example, the Israeli Army has introduced goggles and vests for tank crews which protect against shell fragments, and fire-resistant coveralls and gloves. Various countries are attempting to create universal, multipurpose clothing for the crews of armored vehicles protecting against casualty-producing factors of nuclear, chemical and bacteriological weapons, shell fragments and bullets, and open flame, and permitting the personnel to perform their functional duties for a long time under various climatic conditions at any time of day.

Outfitting tanks with fast-acting automatic systems for neutralizing fires and explosions can make an important contribution to improving their survivability. Such systems, which supply a fire-extinguishing composition to the zone where flame appears in the behind-armor space in less than 100 milliseconds, are finding use in tanks put out in the United States, the FRG, Great Britain, France and Israel.

As already noted, the survivability of an armored object abroad is customarily taken to mean its property not only to retain, but also restore its combat effectiveness under conditions of enemy pressure. Therefore special demands are placed on tank designs for adaptability to repair after combat damages. Fulfilling these demands leads to a situation where essentially all tanks have monoblock engine and transmission units whose replacement time with appropriate technical outfitting of the jobs is measured in several tens of minutes, as well as built-in monitoring systems, quick-release connections and so on.

Numerical and Effective Combat Strength of NATO Armies

18010445g Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 89 (signed to press 10 Jan 89) pp 33-36

[Reference data by Col V. Titov]

[Text]

Large and Small Units, Armament	United States	Great Britain	FRG	France	Italy	Canada	Belgium	Nether-lands	Luxem-bourg	Nor-way	Den-mark	Greece	Turkey	Spain	Portugal
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Personnel, thousands	770	160	290	300	270	30	68	68	0.63	24	17	150	540	230	40
Headquarters:															
Armies	7	-	-	1	-	-	-	-	-	-	-	1	4	-	-
Corps	6	1	3	3	3	-	1	1	-	-	-	4	10	-	-
Divisions	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Divisions:	18	4	12	13	-	-	2	3	-	-	-	14	18	5	-
Infantry	1/ 18,000	-	-	3/ 7,500	-	-	-	-	-	-	-	11/ 12,500	15/ 12,000	-	-
Light infantry	4/ 10,700	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Motorized	1/ 14,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mechanized infantry	-	1/ 16,000	4/ 21,000	-	-	-	2/ 16,000	3/ 17,000	-	-	-	1/.	-	1/ 20,000	-
Mechanized	6/ 17,000	-	-	-	-	-	-	-	-	-	-	-	2/ 13,000	1/ 19,000	-
Armored (Tank)	4/ 17,000	3/ 16,000	(6)/ 22,000	6/ 10,000	-	-	-	-	-	-	-	1/.	1/.	1/ 17,000	-
Armored cavalry	-	-	-	1/ 6,500	-	-	-	-	-	-	-	-	-	-	-

Large and Small Units, Armament	United States	Great Britain	FRG	France	Italy	Canada	Belgium	Nether-lands	Luxem-bourg	Nor-way	Den-mark	Greece	Turkey	Spain	Portugal
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Personnel, thousands	770	160	290	300	270	30	68	68	0.63	24	17	150	540	230	40
Airborne (special forces)	1/ 13,000	-	1/ 9,500	1/ 13,000	-	-	-	-	-	-	-	(1)/.	-	-	-
Air assault	1/ 17,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mountain infantry (alpine)	-	-	1/ 23,000	(1)/ 9,000	-	-	-	-	-	-	-	-	-	2/ 14,000	-
Airmobile	-	-	-	1/ 6,500	-	-	-	-	-	-	-	-	-	-	-
Separate brigades:	17	15	-	-	24	4	-	1	-	1	6	4	24	4	1
Infantry (mechanized infantry)	2	(14)	-	-	(4)	(2)	-	1	-	(1)	1(5)/ 5,000	1	11	-	(1)
Mecha-nized	3	-	-	-	10	1	-	-	-	-	-	-	4	-	-
Armored (armored cavalry)	2	-	-	-	4	-	-	-	-	-	-	3	6	(2)	-
Airborne	-	1	-	-	1	-	-	-	-	-	-	-	1	2	-
Antitank helicopter	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Artillery	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alpine	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-
Special purpose (commandos)	-	-	-	-	-	1	-	-	-	-	-	-	(2)	-	-
Separate units and subunits:															
Special forces groups (regiments)	4	(3)	-	-	-	-	(1)	-	-	-	-	-	-	-	(1)
Separate armored cavalry regiments	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ranger battalions	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Regiments (battalions)	.	6	.	11	-	-	4	-	(1)	(3)	-	1(.)	.	.	14(3)
Battalions (regiments):	20	4	4(15)	(13)	1(2)	-	5	6	-	-	-	2	-	.	-
Pershing 2 guided missiles	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lance guided missiles	8	1	4	-	1	-	1	1	-	-	-	-	-	-	-
Pluton guided missiles	-	-	-	(5)	-	-	-	-	-	-	-	-	-	-	-
Patriot surface-to-air guided missiles	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Large and Small Units, Armament	United States	Great Britain	FRG	France	Italy	Canada	Belgium	Netherlands	Luxembourg	Norway	Denmark	Greece	Turkey	Spain	Portugal
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Personnel, thousands	770	160	290	300	270	30	68	68	0.63	24	17	150	540	230	40
Improved Hawk surface-to-air guided missiles	-	-	-	(3)	(2)	-	2	-	-	-	-	2	-	-	-
Rapier surface-to-air guided missiles	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Roland 2 surface-to-air guided missiles	-	-	3	(5)	-	-	-	-	-	-	-	-	-	-	-
Gepard self-propelled AAA	-	-	(12)	-	-	-	2	5	-	-	-	-	-	-	-
Basic armament: launchers, including															
Pershing 2 guided missiles	117	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lance guided missiles	50	12	24	-	6	-	6	6	-	-	-	-	-	-	-
Pluton guided missiles	-	-	-	32	-	-	-	-	-	-	-	-	-	-	-
Tanks	Around 13,000	Around 1,300	Over 3,000	Around 1,500	Over 1,700	Over 100	Over 400	Around 1,000	-	150	Over 200	Around 1,800	Over 3,700	Over 1,000	Over 100
Field artillery pieces and mortars	Over 12,000	Around 1,000	Over 2,000	Around 1,500	Over 1,300	Over 200	Over 300	Over 1,000	6	400	Around 400	Around 4,000	Over 4,500	Around 2,000	Around 1,000
Antitank weapons	Over 12,000	Around 800	Over 2,500	Over 1,500	Over 1,700	Around 150	Around 530	Over 700	10	.	Over 400	Around 1,500	Around 3,000	Around 700	Over 200
Army aviation helicopters	Over 10,000	Over 300	Around 700	Over 500	Around 400	-	Around 70	Around 100	-	-	Over 20	Over 200	Around 250	Over 150	-

Notes:

1. The table does not include Iceland, which has no armed forces.
2. In table columns written as fractions the numerator gives the number of divisions (brigades) and the denominator gives their approximate personnel strength. An approximate number of combat equipment is given counting stockpiled equipment.
3. The numerical and effective combat strength of U.S. ground forces does not include the organized reserve (over 770,000 persons, 10 divisions, 21 separate brigades, 4 separate armored cavalry regiments, and other units and subunits), and that of other countries does not include territorial troops and reserve components.
4. Pershing 2 missiles will be destroyed in the next few years in accordance with the INF Treaty between the USSR and United States dated 9 December 1987.
5. The strength of the French Army includes the command of the Rapid Action Force (5 divisions: 9th Marine Infantry, 11th Parachute, 27th Mountain, 6th Armored Cavalry and 4th Airmobile as well as other support and service units).
6. The Canadian Armed Forces are divided into six commands according to function: Mobile (includes subunits and units of ground forces on the territory of Canada), Air Force, Navy, Canadian Armed Forces in Europe, and Signal.
7. The Lance guided missiles regiment (Great Britain) has four batteries of three launchers each.
8. The following are the principal tanks: M1 Abrams, M60A1 and A-3 in the United States, Challenger and Chieftain in Great Britain, Leopard 2 in the FRG, AMX-30B2 in France. American, West German, British and French tanks, chiefly of earlier production, are in the inventory of the remaining countries.

Survivability of Aircraft in the Air in Conducting Combat Operations (Based on Experience of Local Wars)

18010445h Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 89 (signed to press 10 Jan 89) pp 37-43

[Part One of article by Col V. Kirillov, candidate of military sciences]

[Text] The question of the survivability[1] of aviation as a whole and of tactical aviation in particular during combat operations is being discussed more and more often in the pages of the foreign press in recent years. The reason for this is a constant increase in aircraft losses in local wars of the 1970's and 1980's. Replacing these losses under present-day conditions is becoming more and more difficult because of high aircraft cost as well as large expenditures of time and funds for training aircraft crews.

Aviation suffers losses both on the ground and in the air during combat operations. Western experts usually research these two aspects separately in studying the experience of wars and armed conflicts. The views of air force specialists of the United States and other capitalist countries on the survivability of aviation in the air, i.e., in performing combat missions, are covered below.

Theoretical studies by foreign specialists concerning survivability problems use an indicator such as the **loss ratio.** This is taken to mean the ratio of aircraft lost to the total number of sorties flown during an operation, over a specific period of combat operations, or in the war as a whole (usually expressed as a percentage).

For example, during air operation Linebacker-2 (18-30 December 1972) in the concluding phase of the aggression in Vietnam, American strategic aviation flew 729 sorties and lost 15 B-52 bombers in the process. The loss ratio was 2 percent.

That level (2 percent) was taken by the American command as maximum. If it was exceeded, flight operations would be suspended and experts would begin to look into the reasons. Here they would proceed from a simple calculation: a squadron or wing which flew an average of two combat sorties a day and suffered "permissible" losses without replacing them would be left with half of the effective combat strength by the end of the second week, i.e., it was essentially noncombat-effective.

In accordance with data published in the western press, in World War II the U.S. Air Force loss ratio was 0.9 percent (i.e., 9 aircraft were shot down for every thousand sorties). It follows that aviation survivability indicators in operation Linebacker-2 were considerably lower. The foreign press notes that a trend toward increased survivability (a reduction in the loss ratio) was not registered in subsequent brief armed conflicts in the Near East and in the South Atlantic over the Falkland (Malvinas) Islands (statistics analyzed related only to periods of combat operations with a "standard" intensity of two combat sorties per day).

In the views of foreign military experts, many factors have an immediate influence on aviation survivability indicators under conditions of real opposition by enemy air defense weapons. Of these, the primary factors are "threat," "protection," "evasion" and "neutralization."

The **"threat" factor.** An aircraft on a combat mission is subjected to threat from the following kinds of weapons: AAA, SAM systems and enemy fighters. Depending on the nature of the mission being performed, it can be affected by one, two or all of the above air defense weapons. For example, an attack aircraft is constantly in the zone of fire of low-altitude air defense weapons during close air support of ground forces on the battlefield. A bomber can be subjected to all kinds of threats in delivering strikes against targets at a great depth. In one case the effectiveness of protection is determined chiefly by the degree of vulnerability of the aircraft construction to AAA projectiles, and in another case by results of using on-board means of defense against enemy fighters and by the availability of real time intelligence on the disposition of enemy SAM systems.

AAA. In analyzing the reasons for losses of tactical strike aircraft in the war in Vietnam, American experts determined that over half of the total number of fighter-bombers and attack aircraft shot down were hit by the fire of light AAA. This was one of the war's lessons, inasmuch as the U.S. Air Force command expected the primary threat would come from more sophisticated means of combating aircraft—SAM systems. The offensive potential of SAM systems was evaluated as much higher than that of AAA in connection with the fact that the latter allegedly had exhausted its combat capabilities long ago.

It was believed that the high flight speed of modern aircraft was reliable protection against antiaircraft projectiles, inasmuch as fire could not be conducted with sufficient accuracy and was ineffective against a target displacing swiftly relative to the gunner on the ground. This viewpoint was convincingly overturned in Vietnam in 1968. The new F-111A fighter-bomber sent to test its combat capabilities under limited war conditions was shot down by light AAA on the third flight. During the previous three years of the aggression, DRV AAA had inflicted considerable damage on subunits of American F-105 tactical fighters and A-4 deck-based attack aircraft (after which they began to be replaced by aircraft with greater survivability—F-4 and A-7, Fig. 1 [figure not reproduced]).

Pentagon specialists saw the following reasons for the impressive losses of modern aircraft to the fire of an "obsolete" kind of weapon.

The increased AAA threat did not arise of itself, but under the pressure of new means of combating aircraft in the air. The SAM systems which appeared in the DRV defense system made medium and high altitudes extremely dangerous for aircraft flights. Over 30 American fighter-bombers operating at these altitudes were shot down by surface-to-air missiles in the period from July through October 1965 alone.

American aviation shifted to low flight altitudes with the objective of reducing the SAM system radar detection range of aircraft and cutting the losses of American aviation. But these were the altitudes covered by AAA fire, and its density rose as air aggression against the DRV escalated.

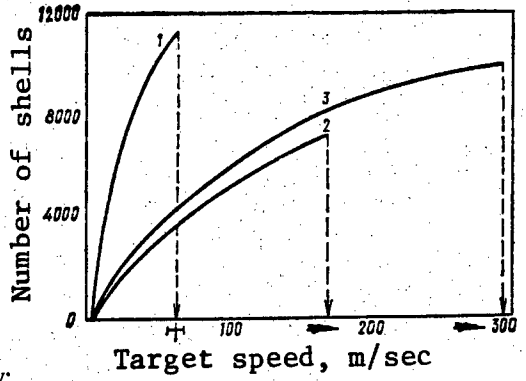
A high flight speed, the tested procedure for overcoming AAA opposition, "worked" only on a route. In flying at transonic speed over terrain relief, the aircraft would cross the zone of fire quickly, its detection time was sharply reduced, and combat crews did not have time to make ready to fire. The situation changed above the target on the final leg of the combat mission, when the aircraft executed an ascending combat maneuver for the attack run, its displacement speed relative to the AAA battery dropped and the probability of being hit by antiaircraft projectiles increased.

The appearance of bombs with a braking device intended for low altitude employment in the inventory of American fighter-bombers provided an opportunity of avoiding the execution of difficult and dangerous ascending maneuvers over the target, but the accuracy of low-altitude bombing was low. Therefore an attack from a dive with a preliminary ascending maneuver was used most often. Bombing accuracy came into contradiction with survivability. Calculations confirmed this: the number of antiaircraft projectiles hitting the target almost doubled from the moment the maneuver began (at a speed of 925 km/hr) until it was over (740 km/hr).

SAM systems. Foreign military specialists note that this new weapon for combating aircraft did not replace, but supplemented, the old weapon. One air defense weapon would compensate for the shortcomings of the other in the course of joint operations to repel air raids. The surface-to-air guided missile had certain advantages over the antiaircraft projectile.

First of all, according to statistical data, up to ten missiles were expended for one aircraft downed, while the expenditure of antiaircraft shells was more than 8,000 (Fig. 2). Surface-to-air guided missiles greatly surpassed AAA in the range and altitude of engaging airborne targets.

Fig. 2. Expenditure of antiaircraft shells per downed aircraft



Key:
1. World War I
2. World War II
3. Local wars of the 1970's and 1980's

Secondly, a surface-to-air missile guided by radio commands from external sources or by a homing head would "pursue" a target, while the antiaircraft shell would be directed by the gun crew to a predicted position, the exact location of which was rather difficult to determine.

Thirdly, any hit by a missile on the aircraft entailed aborting the combat mission and in the best instance returning to base, while aircraft with several holes from antiaircraft shells would bomb and land.

The foreign press notes that a successful version of integrated use of AAA and SAM's was found by the defenders of Vietnam's sky. After American aviation shifted to low altitudes, fighter-bombers changed the methods of attack. They began to execute an ascending combat maneuver with subsequent bombing at large dive angles within the limits of a cone of dead space over the SAM position (a zone not covered by the missile guidance radar). Then the space not covered by missiles was covered by antiaircraft fire and the two air defense weapons, which merged as one, forced the aggressors to give up this tactic.

In examining ground air defense weapons, foreign experts emphasize that AAA essentially has reached the limit of its combat capabilities while missile systems continue to improve. For example, new SAM systems, included in the tactical air defense, were employed in combat operations in the Near East. Israeli aviation which tried to operate under the "Vietnam model" in the changed conditions suffered heavy losses in the October War of 1973. As attested by the journal INTERNATIONAL DEFENCE REVIEW, fighter aviation accounted for 10 percent of the losses and 90 percent were divided evenly between SAM systems and AAA. It was noted that the proportion of SAM systems in the overall "share" of downed aircraft rose appreciably.

Fighter aviation. American specialists viewed the threat on the part of fighters as applied to their performance of specific combat missions. It was noted that missions of a

defensive nature (screening troops and supporting combat operations of other air arms) were accomplished by fighter aviation using clear-cut offensive operations—by attacking the enemy aircraft attacking them.

The appearance of medium-range air-to-air guided missiles (Sparrow) in the late 1970's opened the path for all-aspect air-to-air combat, and the threat of a missile attack from any direction arose. The range of weapon employment here considerably surpassed the range of detection of the attacking aircraft. Fighter combat formations would be dispersed laterally, in altitude and in depth. Diversionary maneuvers or actions found a place in tactics. False threats would be created on one axis in order to camouflage a missile attack from another direction and make it a surprise. The functions of elements for different tactical purposes changed—each aircraft in a pair or flight became a strike aircraft.

According to foreign military specialists, such air defense weapons as SAM systems and AAA operated together against airborne targets in one zone, while fighters and SAM systems performing the same combat mission of screening the troops distributed their efforts to different zones, i.e., they maintained not fire coordination, but tactical coordination in time and lines organized in such a way that fighters did not enter the SAM system's envelope. Two reasons hampered closer coordination: the complexity of the existing air situation and imperfection of recognition systems, as a result of which there was a real chance that a SAM would hit a friendly aircraft which had engaged the enemy.

Two American Phantom aircraft were shot down by friendly fighters of the very same type because of the unreliability of on-board radar identification systems in the war in Vietnam. This forced using the following tactic: one fighter would close with the enemy aircraft to a range permitting visual identification from external signs and would give another aircraft permission to engage the enemy. Inasmuch as a threat could emanate not only from hostile, but also from friendly weapon systems because of the impossibility of accurate airborne target identification, five NATO states (United States, Great Britain, FRG, France and Italy) supported a program for creating a unified radar identification system for bloc armed forces.

According to views of foreign specialists, the **"protection" factor** associates the defensive capabilities of equipment and tactics. Its components are invulnerability of aircraft design and systems, crew protection, and individual and group protection.

Analyzing the data characterizing attack aircraft survivability in a combat situation, western experts singled out the following "priority" of reasons which led to aborting a combat mission because of equipment damage. The fuel system remains the most vulnerable element of aircraft construction. Its damage leads to fires in the air. It was emphasized that the proportion of supersonic aircraft losses because of this compared with losses of subsonic aircraft (which participated in the Korean War) did not decrease, but rose (one-fifth and two-fifths of the total number respectively). The basic reasons for fires were damaged lines, fuel system units and fuel tanks. Efforts taken to prevent fires led to a reduction in inflammability of fuel, placement of fuel system components under cover of other construction elements, a reduction in fuel tank vulnerability, and redundancy of supply lines.

The possibility of the pilot or crew being hit is in second place among reasons for an aircraft's low survivability. It is noted that all second-generation jet aircraft which participated in local wars were protected only against being hit by surface-to-air and air-to-air missiles. To reduce the likelihood of a pilot being hit by missiles, aircraft cockpits were made flush with the fuselage and the canopy was blended integrally with the aircraft's streamlined silhouette. The pilot's rear was covered by a thick armor back with a large headrest inasmuch as it was assumed that a missile attack could be made only from the rear hemisphere. Armor was absent in front and on the side inasmuch as no protection was envisaged against the fire of AAA and enemy fighters armed with aircraft cannon. Moreover, guns had been removed from American tactical fighters in the 1950's, since according to theories existing at that time the outcome of combat was to be decided by the first missile attack. They were replaced on the aircraft, however, after the very first fight against Vietnamese fighters.

Experience gained in local wars forced changing the cockpit position in the overall scheme of combat aircraft design. Although a broad armor back and low seat increased crew safety, the cockpit had to be raised and the pilot "exposed." This occurred because supersonic fighters engaged in traditional maneuverable combat instead of the expected high-speed missile-attack intercepts in pursuit. Under these conditions the most important factor was the opportunity for the pilot to have a view of space, which assured him timely visual detection of the enemy. A fighter sweep removed the threat of attack to a greater extent than passive protection, since on catching sight of the enemy at long range, the pilot succeeded in undertaking a defensive maneuver and evading an attack.

High tear-shaped canopies are installed in modern fighters (F-15 and F-16, Fig. 3 [figure not reproduced]). The aircraft drag which increases because of this is compensated by the thrust of a powerful engine. Other measures to reinforce pilot protection include developing a protective helmet of a new design, installing bulletproof glass in the canopy, and "all-around" armoring of the cockpit. The foreign press indicates that losses due to pilot death were cut in half as a result of these measures.

At the same time, losses connected with control system damage remained high. Beginning with the Korean War, damage to controls was the reason for aircraft loss in

approximately one case out of five. An analysis showed that the distribution of shell holes occurred evenly on the entire surface of the fuselage and wings. Connecting control mechanisms occupied the greatest unprotected area (from the cockpit to the stabilizer and ailerons). Hydraulic control system lines, broken by a single shell fragment, also proved vulnerable.

Having studied the experience of aviation's involvement in armed conflict, western experts concluded the need to create control systems which would have reliable damage protection. A remote-control electrical system was installed in F-16 fighters which participated in combat operations in the Near East. Foreign specialists note that its presence permitted reducing vulnerability of system wiring (connections), improving static and dynamic control characteristics, precluding undesirable cross connections between control channels, simplifying aircraft balance and reducing the danger of the aircraft getting into flight configurations that are beyond critical.

The problem of protecting a strike aircraft by gunfire became acute in the latest local wars. The first jet bombers had gunners as part of the crew as well as weapons which protected the rear hemisphere. In the war in Vietnam they were replaced by fighter-bombers with cannon and missiles directed only forward. To repel attacks by enemy interceptors, they had to operate as fighters, i.e., turn to meet them.

But a heavy aircraft could not engage in protracted defensive combat after aborting the flight to the strike objective, and supersonic speed no longer allowed it to "break off" from the interceptor pursuing it. The fighter-bomber itself, which was given the capability of combating fighters, was unable to display these qualities under the combat conditions which were created. The bomb load on external stations, which increased drag and deprived the aircraft of necessary maneuverability, largely hindered this. All this forced arrangement of protection for the strike aircraft by other means. After American aviation losses exceeded permissible limits, strike elements began to be screened en route to and from the target by a beefed-up fighter detail, but the close escort method revealed not only advantages, but also obvious disadvantages in the course of practical application.

First of all, strike aircraft with a full set of munitions would maintain a route speed of approximately 800 km/hr. Covering fighters were forced to fly at equal speeds in order not to lose visual contact with escorted aircraft. Enemy interceptors would enter battle with a speed advantage and would penetrate to the strike aircraft.

Secondly, the presence of air-to-air missiles permitted interceptors to attack from long range, which gave the attackers additional tactical advantages.

Thirdly, attempts to organize reliable protection of strike aircraft by increasing the number of escort aircraft produced no positive results. Previously the optimum ratio of covering aircraft to the strike element was 2:3, i.e., a squadron of bombers was to be covered by two flights of fighters. This ratio changed and became 3:3, i.e., the number of escort aircraft and strike element aircraft became equal, but the quantitative increase in fighters did not produce the expected result. Free to choose the direction of attack, interceptors would close with the mixed force and penetrate to the open-fire line from the rear at increased speed.

Fourthly, a variant of reinforcing the protection of strike aircraft by one more element, a long-range intercept element, did not prove out. In striving to meet the enemy on distant approaches to screened bombers, fighters would go outside the limits of the corridor made in advance in the ground air defense force grouping and come under the fire of air defense weapons.

Fifthly, escort to a great depth (in Vietnam the combat operating radius of aircraft reached 800 km) entailed the need to suspend fuel tanks on the covering aircraft, as a result of which they lost maneuver qualities for conducting air-to-air combat.

Foreign military specialists emphasize that tactical strike aircraft (F-111 and Tornado, Fig. 4 [figure not reproduced]) still use only offensive weapons for protection. Engaging an interceptor by fire (disrupting an attack) is possible only after a defensive closing maneuver. It continues to be possible for the bomber to actively defend itself only at short ranges, while the interceptor has become capable of employing weapons against it with a time advantage and at long range. In this regard a search continues for acceptable defensive versions of strike aircraft.

Group protection presumes the constitution of mixed combat formations consisting of aircraft having varying tactical purposes. Such combat formations found wide use in local wars. They would include five elements with different tactical purposes: final reconnaissance, air defense suppression, strike, EW-jammer aircraft, and covering fighters. Only one element in this formation performed the primary mission of delivering a strike against a given target, while the other elements were limited to support functions. Such an uneconomical expenditure of forces is permissible only when there is an excess. Foreign experts assume that in the near term a reduction in the number of support aircraft in a mixed combat formation is inevitable. It is caused by the complexity of organizing combat control and coordination and by the sharp increase in the cost of combat aircraft. Primary attention here will be given to improving the effectiveness of means of individual protection which enable bombers to shift to autonomous operations, and to reducing the number of support forces which do not directly participate in delivering the strike.

(To be concluded.)

Footnotes

1. Foreign military specialists take the term "aviation survivability" to mean the ratio of the number of aircraft remaining in formation to the overall number of aircraft which existed before the beginning of combat operations (or of an operation). Consequently, it depends on the magnitude of losses (the higher they are, the lower the survivability and vice versa)—V.K.

French Strida-2 Automated Air Defense Control System

18010445i Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 89 (signed to press 10 Jan 89) pp 43-46

[Article by Col V. Almazov]

[Text] The air defense of French territory is accomplished by forces and assets of the national air defense system. The mission of organizing it rests with the national air defense command, part of the Air Force. At the present time the entire territory of France is divided into four air defense zones (Northeastern, Northern, Southwestern and Southeastern), the boundaries of which basically coincide with those of Air Force districts I, II, III and IV respectively. An air defense zone is the lowest territorial unit within which combat operations are planned and direction of forces and assets is exercised.

Operational control of air defense forces and assets is exercised at three levels: air defense command operations center, zone operations centers (four according to the number of zones), and control and warning centers or posts. An air defense command operations center is the highest air defense control entity. It collects, processes and assesses data on the air situation (Fig. 1 [figure not reproduced]). If necessary, conclusions from the assessment are reported at the government level and to commands, and steps are taken to prevent any violation of French air space. During combat operations the operations center issues target designations by air defense zones, it makes decisions on command and control of combat operations, and gives instructions for maneuvering zone forces and assets with the objective of repelling an air attack along the most dangerous axes. The air defense command operations center is located in Taverny (north of Paris) and is protected against damage by conventional attack weapons. In addition, there is an alternate national air defense operations center not far from the city of Lyon, situated in rocky ground and protected against enemy attack using nuclear weapons.

Air defense zone operations centers command and control air defense forces and assets of their own zones. They estimate the air situation and organize the intercept of airborne targets in the zone of responsibility based on a target designation from the air defense command operations center employing Mirage-F.1C (see color insert [color insert not reproduced]), Mirage-IIIC and Mirage-2000 fighter-interceptors and Crotale SAM system subunits (Fig. 2 [figure not reproduced]). A zone operations center serves as the air defense zone commander's command post. He uses it to direct his subordinate units and subunits, fighter aviation, control and warning centers, control and warning posts, and observation and warning posts. Air defense zone commanders are deputy commanders of the corresponding Air Force districts. In case the national air defense main and alternate command centers are disabled, each of the four air defense zone operations centers can perform their functions.

The control and warning centers are the principal control entities in the air defense system. They perform surveillance of air space; detect, identify and track airborne targets; transmit warning signals, alert notifications, and commands for scrambling fighter-interceptors; and they exercise control over them while guiding them to targets and returning them to their own airfield and transmit target designations and authorization for SAM systems to open fire. In contrast to control and warning centers, control and warning posts have fewer capabilities for tracking targets and controlling intercept.

The eight control and warning centers are located in Brest, Saint-Mar-la-Pil (near the city of Tours), Mont-de-Marsan, Nice, Lyon, Contrexeville, Dragenbronn (north of Strasbourg) and Doullens. Control and warning posts are situated at Narbonne (on the Mediterranean coast) and in Romilly (southeast of Paris).

Command and control of air defense is organized through the far-flung network of the Strida-2 automated system, which is used to accomplish the following missions:

—Continuous air space surveillance for detecting and intercepting airborne targets;

—Transmission of data on airborne targets to appropriate control and warning centers;

—Collection, accumulation and processing of data on targets and on the status of friendly air defense forces and assets, and displaying this data on air situation indicator screens;

—Centralized and decentralized control of active air defense weapons in intercepting airborne targets;

—Air traffic control and support of flight safety for military and civilian aircraft.

Judging from foreign press announcements, the Strida-2 automated control system is capable of simultaneously tracking several hundred airborne targets and controlling

the intercept of tens of targets. It provides an optimum version of intercept and selection of the most advisable weapon systems for engaging specific airborne targets.

The Palme-G (THD 1955) 3-D radars, LR-23 (TRS 2050) and TRS 2055 2-D radars, Satrap (TRS 2230) heightfinding radars, and Tiger (TRS 2100) low-altitude target acquisition radars are used in the automated control system to collect data on the air situation. This equipment is located basically together with control and warning centers as well as at individual surveillance and warning posts situated along the French border to create a continuous radar field. Principal radar characteristics are given in the table.

Basic Radar Specifications and Performance Characteristics

Characteristics	Radar Type				
	Palme-G (THD 1955)	LR-23 (TRS 2050)	TRS 2055	Satrap (TRS 2230)	Tiger (TRS 2100)
Detection Range, km*	400	375	200	510	120
Wavelength, cm	10	23	23	10	10
Peak Power, megawatts	20	2.2	2.2	0.7	0.1
Antenna Azimuthal Scan Rate, rpm	6	6	7.5&12	-	12
Antenna Dimensions, m	16x6	13x9	7x5	9x8	5x2.3

*For a fighter with radar cross-section of 2 m^2.

Various methods are used to provide the necessary antijam protection of radar equipment, including the use of radars functioning in different frequency bands (for example, 23 cm and 10 cm). It is believed that use of radars in the 23 cm wave band permits improving acquisition characteristics under conditions of ground clutter and reflections from hydrometeors, and permits protecting radars more effectively against active jamming. The latter is explained by the fact that creating airborne active jammers in this band involves the difficulty of realizing them in size and weight characteristics comparable to similar devices operating in the 10-cm band. In addition, radar protection is provided by various methods of controlling transmitter emission modes, by special diversionary decoy transmitters and so on.

Data collected with the help of radars is transmitted to the appropriate control and warning center for computer processing and analysis. Processed data is displayed on screens, where appropriate symbols as well as codes and texts are superimposed on radar target returns. Each control and warning center has the Emir radar data processing equipment, a main IBM 370 series computer, and 20-40 Visi-4 console indicators. The Visi-4 accommodates 40-cm indicators displaying air situation data coming from radars and being processed by the computer; one or more color indicators 13-35 cm in diameter capable of lighting up as many as 4,000 characters for displaying detailed data about certain operations (tracking, intercept) or data in an established format (aircraft flight plans, equipment status and so on); several keyboards and switching devices for selecting necessary data or for controlling equipment operation; and a data transmission system control panel.

Warning centers and posts communicate with each other with the help of special data transmission channels, which include cable communication lines and the French Air Force ER-70 tropospheric and radio relay communication system. In the opinion of French military specialists, the presence of redundant data transmission channels and use of digital data transmission methods provide for a reliable exchange of data among any air defense system control points and centers.

After airborne targets have been detected by radar, data on them (range, azimuth, altitude and radar recognition data) goes to the control and warning center, where they are input to the tracking computer; every target is given a conditional number (index) and quality coefficient. The computer continuously compares the local air situation data, which then goes to central storage at the control and warning center. The central computer selects data on the local air situation from central storage and sends it to the zone operations center central storage as well as to combat operations support storage. Air situation data of all control and warning centers which are part of a certain sector is collected in the zone operations center central storage. After additional processing of this data, the zone center central computer sends it to the air defense command operations center and to generalized air situation indicators. In addition, central storage data is used by the weapon selection computer for assessing the threat for each target and distributing weapons to targets. After this, appropriate operators assign missions to assigned weapon systems and transmit necessary orders and commands.

If a fighter-interceptor is selected for engaging a specific airborne target, appropriate data goes from the sector central storage to the control and warning center intercept computer, which exercises control over the interceptor beginning with its take-off and ending with its return to its airfield. Two control messages are transmitted every ten seconds to check serviceability of operation of data transmission equipment lines. If a control message is not received on the receiving side of the main communication line 15 seconds after the beginning of transmission, a special symbol will light up on the operator's

screen indicating a malfunction in this line and data will be transmitted over an alternate line until the malfunction is remedied.

The Strida-2 system was placed on alert duty in the 1960's and since then both its software and its equipment have been continuously modernized and upgraded. For example, new IBM 370/158 computers and a Visi-4 data display subsystem were delivered to control and warning centers in the mid-1980's. The present modernization phase involves deploying radars for detecting and tracking low-flying targets, reducing the lower boundaries of the radar field, and using an airborne radar early warning and control system (AWACS system), for which four E-3A Sentry aircraft have been purchased (two already have been delivered to the French Air Force).

The Strida-2 automated system for command and control of air defense forces and assets is interfaced with the automated system for command and control of forces and assets of the NATO NADGE allied air defense system and with national air defense systems of Spain (Combat Grande), the FRG (GEADGE) and Great Britain (UKADGE), which permits estimating the air situation 1,000 km from the French borders.

Effective Combat Strength of NATO Air Forces

18010445j Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 89 (signed to press 10 Jan 89) pp 49-54

[Reference data by Col V. Sibiryakov]

[Text] In continuing the arms race, the U.S. military-political leadership and its bloc allies devote much attention to developing the air forces. Combat capabilities of military aviation are being augmented by outfitting them with new aviation equipment, modernizing existing weapon systems, and upgrading the command and control system, the organizational structure and the combat training of large and small units. The foreign press notes that appreciable changes have occurred as a result of these measures being taken in air forces of NATO member countries.

The deployment of new MX missiles continues, units and subunits of strategic B-1B bombers carrying cruise missiles have been activated, and aircraft in the inventory are being modernized within the framework of a build-up in strategic nuclear forces, or the so-called triad, two components of which (ICBM's and strategic bomber aviation) are part of the air forces. As of the present time over 250 ground-launched cruise missiles have been deployed as part of U.S. Air Force Europe and on the territories of Great Britain, the FRG, Italy and Belgium, and work is under way to create advanced missiles, aircraft, guided bombs and so on.

West European countries that are members of the NATO bloc also are building up the combat might of their air forces. Air forces of Great Britain, the FRG and Italy are completing the re-equipping of units and subunits with the latest Tornado tactical fighters and the French Air Force is receiving Mirage-2000 tactical fighters. Eighteen Mirage IVP strategic bombers have been refitted as platforms for missiles with nuclear warheads. Having completed the first phase of reoutfitting their units and subunits with F-16 tactical fighters, Belgium, the Netherlands, Denmark and Norway decided to purchase more of such aircraft.

The effective combat strength of air forces of these states is given below (the table is compiled based on data published in the foreign press).

Air Arm, Weapon Systems, Aircraft and Helicopters	Number of Squadrons (Aircraft, Helicopters, Launchers in Them)	Including
1	2	3
	United States of America[1]	
	Regular Air Force	
	(580,200 Persons, Over 4,880 Combat Aircraft and 1,256 ICBM's and Ground-Launched Cruise Missiles)	
ICBM's	25 (1,000)	11 (527 Minuteman III), 9 (450 Minuteman II), 5 (23 MX)
Ground-launched cruise missiles	14[2] (256)	4 (96—UK), 4 (64—FRG), 6 (96—Italy)
Total	39 (1,256)	
Strategic:		
Bombers	25 (392)	4 (73 B-1B), 6 (96 B-52H), 10 (167 B-52G), 5 (56 FB-111)
Tankers	33 (568)	31 (511 KC-135), 2 (57 KC-10A)

Reconnaissance aircraft, airborne command posts	12 (112)	1 (10 SR-71), 1 (11 U-2, 28 TR-1), 9 (59 RC-135 & EC-135), 1 (4 E-4B)
Total	70 (1,072)	
Military-transport:		
Strategic	17 (285)	4 (67 C-5A & B), 13 (218 C-141B)
Tactical	14 (206)	14 (206 C-130)
Special purpose	6 (69)	3 (11 MC-130), 1 (9 AC-130), 1 (6 CH-3E), 1 (31 MH-53 & 12 UH-1N & H)
Auxiliary	Over 20 (around 300)	8 search and rescue squadrons (48 HC-130, 48 HH-3 & HH-53, 23 UH-1H & HH-1, 9 UH-60), 3 medical transport squadrons (17 C-9), 3 weather reconnaissance squadrons (12 & 7 WC-135), around 10 separate transport subunits (8 C-135, 7 C-137, 79 C-21, C-35 & CT-39, 18 C-23 and others)
Total	Around 60 (around 900)	
Tactical:		
Fighter-bombers and attack aircraft	78 (2,012)	8 (394 F-4), 17 (410 F-15), 24 (584 F-16), 5 (72 F-4G Wild Weasel), 10 (216 F-111), 14 (336 A-10)
Air defense fighters	3 (54)	3 (54 F-15)
Reconnaissance aircraft, AWACS, EW	13 (200)	6 (108 RF-4C), 4 (34 E-3A & B), 3 (11 EC-130, 11 EC-135, 36 EF-111)
Special	13 (253)	4 Aggressor (80 F-5E & T-38), 9 target designation and guidance squadrons: 6 (145 OV-10 & O-2A), 3 (28 CH-3)
Operational training	18 (465)	1 (40 F-111), 3 (94 F-16), 7 (150 F-4), 2 (40 F-15), 3 (105 A-10), 1 (20 F-5), 1 (15 RF-4)
Total	125 (2,984)	
Air Force Reserve Command (67,400 persons, 220 combat aircraft)		
Fighter-bombers and attack aircraft	11 (210)	2 (36 F-16), 5 (102 F-4), 4 (72 A-10)
Transport	16 (136)	14 (120 C-130), 1 (8 C-141), 1 (8 C-5A)
Tankers	3 (24)	3 (24 KC-135)
Special and auxiliary	6 (44)	1 (10 AC-130), 1 (4 WG-130), 4 (14 HC-130, 8 HH-3E & 8 HH-1)
Subunits assigned to MAC	21 (-)	Do not have their own aircraft, but their crews are trained for flying C-5's (4 squadrons), C-141's (13), KC-10's (3) and C-9A's (1)
Total	57 (414)	
Air National Guard (116,700 persons, over 900 combat aircraft)		
Fighter-bombers	32 (571)	2 (25 F-16), 11 (168 F-4), 1 (12 F-4G Wild Weasel), 13 (270 A-7), 5 (96 A-10)
Air defense fighters	15 (192)	11 (126 F-4C), 2 (36 F-16), 2 (30 F-106)
Reconnaissance aircraft	6 (108)	6 (108 RF-4C)
Transport	19 (193)	17 (168 C-130), 1 (17 C-5), 1 (8 C-141)
Tankers	13 (104)	13 (104 KC-135)
Special, auxiliary	6 (80)	3 (53 OA-37B), 1 (8 EC-130), 1 (8 HC-130), 1 (11 HH-3E)
Total	92 (1,248)	
Great Britain (93,400 persons, around 700 combat aircraft)		
Tactical fighters	16 (260)	9 (148 Tornado-GR.1), 2 (43 Buccaneer-S.2, of which 18 are in reserve), 2 (36 Jaguar-GR.1), 3 (33 Harrier)
Air defense fighters	9 (144)	7 (120 Phantom, of which 36 are in reserve), 2 (24 Tornado-F.3)
Reconnaissance and land-based patrol aircraft	7 (55)	2 (24 Jaguar-GR.1), 4 (28 Nimrod), 1 (3 Canberra-PDS)
Tankers	3 (32)	1 (17 Victor-K.2, of which 6 are in reserve), 1 (9 VC-10.K 2, 3), 1 (6 Tristar)

Transport	7 (79)	1 (11 VC-10C.1 and 3 Tristar), 4 (41 C-130H), 2 (7 Andover, 6 HS-125, 6 Pembroke, 2 BAC-146 and 3 helicopters)
Operational training	18 (229)	3 (58 Tornado), 1 (9 Buccaneer), 1 (18 Phantom), 1 (15 Jaguar), 1 (20 Harrier), 1 (3 Nimrod and 4 Canberra), 1 (5 C-130), 1 (8 Victor-K.2), 6 (72 Hawk), 2 (5 Hunter, 2 Jet Provost and 10 helicopters)
Airborne early warning and EW	4 (49)	1 (10 Shackleton-AEW, of which 5 are in reserve), 1 (31 Canberra), 1 (3 Nimrod), 1 (5 Andover)
Helicopters (transport and search and rescue)	8 (105)	3 (38 Wessex), 2 (27 Chinook-HC.1), 1 (14 Sea King), 2 (26 Puma)
Auxiliary (including training)	. (340)	45 Hawk-T.1, 145 Jet Provost, 110 other aircraft as well as over 40 helicopters
Antiaircraft missiles	11 (136)	2 (64 Bloodhound-2), 9 (72 Rapier)
FRG		
(110,700 persons, around 680 combat aircraft)		
Fighter-bombers and attack aircraft	22 (502)	11 (180 Tornado), 4 (76 F-4F), 7 (126 Alpha Jet). 47 Alpha Jet and 73 F-104G in reserve
Air defense fighters	4 (76)	4 (76 F-4F)
Reconnaissance aircraft	4 (76)	4 (76 RF-4E)
Transport	11 (228)	4 (89 C-160 Transall), 5 (110 UH-1D & 3 Bell 212), 2 (4 Boeing 707, 3 C-140, 6 HFB-320, 3 VFW 614, 6 Do-28, 4 UH-1D)
Operational training	2 (30)	1 (20 Tornado)[3], 1 (10 F-4E)
Special, auxiliary (including training)	. (182)	65 Do-28, 35 T-37, 40 T-38A, 8 HFB-320 AEW, 34 P-149
Operational-tactical missiles	8 (72)	8 (72 Pershing-IA)
Antiaircraft missiles[4]	60 (432)	36 (216 Improved Hawk), 24 (216 Nike-Hercules)
France		
(95,000 persons, around 800 combat aircraft)		
Intermediate range ballistic missiles	2 (18)	2 (18 S-3D)
Strategic bombers	2 (25)	2 (18 Mirage-IVP, 7 Mirage-IVA in reserve and in training center)
Fighter-bombers	15 (225)	8 (120 Jaguar), 5 (75 Mirage-IIIE), 2 (30 Mirage-2000N)
Air defense fighters	11 (183)	2 (48 Mirage-IIIC & E), 7 (105 Mirage-F.1C), 2 (30 Mirage-2000)
Reconnaissance aircraft	3 (53)	2 (38 Mirage-IIIR), 1 (15 Mirage-F.1R)
Transport	7 (126)	1 (6 DC-8F), 6 (120 C-160 Transall)
Tankers	3 (11)	3 (11 KC-135)
Operational training	. (309)	25 Jaguar, 54 Mirage IIIB, 20 Mirage-F.1B, 102 Alpha Jet, 108 Magister
Helicopters	6 (131)	91 Alouette III and II, 40 Puma and Dauphin
Special and auxiliary	. (around 400)	Light transport, liaison, training aircraft and helicopters
Antiaircraft missiles	12 (48)	12 (48 Crotale)
Italy		
(73,000 persons, over 400 combat aircraft)		
Fighter-bombers and attack aircraft	7 (123)	3 (54 Tornado), 1 (18 F-104S), 2 (36 G-91), 1 (15 MB-339)
Air defense fighters	7 (84)	7 (84 F-104S)
Reconnaissance aircraft	6 (84)	2 (30 RF-104G), 2 (36 G-91R), 2 (18 Atlantic)
Transport	3 (45)	2 (32 G-222), 1 (10 C-130H, 2 Falcon-50, 1 Gulfstream)
Operational training	2 (34)	1 (10 Tornado)[3], 1 (24 TF-104G)
Special and auxiliary (including training)	. (around 350)	6 G-222, 6 PD-808, 22 P-166, 32 S1A1-208M, 2 DC-9, 50 G-91T, 110 MB-339, 30 SF-260M, 20 AB-47, 23 AB-204, 25 AB-212, 19 CH-3, 4 CL-215 and others
Antiaircraft missiles	9 (100)	8 (96 Nike-Hercules), 1 (4 Spada)

Canada		
(38,300 persons, over 180 combat aircraft)		
Tactical fighters and air defense fighters	9 (around 150)	6 (around 100 CF-18), 3 (around 50 CF-5)
Transport	6 (50)	4 (27 CC-130E & H), 1 (5 CC-137), 1 (7 CC-109, 2 CC-117, 2 CC-132, 5 CC-144, 2 CC-137)
Transport (rescue)	4 (40)	4 (14 CC-115, 7 CC-138, 11 CH-113, 3 CH-118, 5 CH-135)
Land-based patrol	6 (33)	4 (18 CP-140), 2 (15 CP-121)
ASW helicopters	3 (35)	3 (35 CH-124)
General purpose helicopters	7 (88)	7 (21 CH-135, 46 CH-136, 7 CH-147 & 14 Bell 206B)
Special and auxiliary (including training)	. (over 300)	12 CF-5B, over 20 CF-18, 4 CC-132, 7 CC-117, 130 CT-114, 5 CC-129, 13 CT-133, 20 CT-134, 7 CH-118, 21 CH-135, 20 CH-136, 18 CH-139 and others
Belgium		
(18,800 persons, 144 combat aircraft)		
Fighter-bombers	5 (90)	4 (72 F-16), 1 (18 Mirage-VB)
Air defense fighters	2 (36)	2 (36 F-16)
Reconnaissance aircraft	1 (18)	1 (18 Mirage-VBR)
Transport	2 (24)	1 (12 C-130H), 1 (2 Boeing 727, 3 HS-748, 5 Merlin-3, 2 Falcon-20)
Helicopters	1 (8)	3 HSS-1, 5 Sea King (search and rescue service)
Operational training and liaison	5 (82)	2 (31 Alpha Jet), 2 (28 SF-260), 1 (23 CM-170 Magister)
Antiaircraft missiles	6 (36)	6 (36 Nike-Hercules)
Netherlands		
(18,000 persons, 214 combat aircraft, including 18 F-16's in reserve)		
Tactical fighters (including reserve)	6 (124)	4 (72 F-16), 2 (52 NF-5A)
Reconnaissance aircraft	1 (20)	1 (18 RF-16, 2 F-27MR)
Operational training	2 (30)	1 (12 F-16B), 1 (18 NF-5B)
Transport	1 (12)	1 (12 F-27)
Helicopters	1 (4)	1 (4 Alouette-III, search and rescue service)
Antiaircraft missiles	14 (59)	12 (36 Improved Hawk), 2 (23 Nike-Hercules)
Norway		
(9,100 persons, 97 combat aircraft)		
Tactical fighters and air defense fighters	5 (97)	4 (67 F-16), 1 (30 F-5A)
Reconnaissance aircraft	1 (7)	1 (7 P-3B)
Transport	2 (15)	1 (6 C-130, 3 Falcon-20), 1 (4 DHC-6 & 2 UH-1B)
Helicopters	4 (40)	2 (24 UH-1B), 1 (10 Sea King, search and rescue service), 1 (6 Lynx)
Operational training	1 (19)	1 (19 Safari)
Antiaircraft missiles	4 (36)	4 (36 Nike-Hercules)
Denmark		
(6,900 persons, 104 combat aircraft)		
Tactical fighters and air defense fighters	5 (84)	4 (64 F-16), 1 (16 F-35XD, 4 TF-35)
Reconnaissance aircraft	1 (20)	1 (16 RF-35XD & 4 TF-35)
Transport	1 (13)	1 (3 C-130H, 3 Gulfstream-III, 7 T-17)
Search and rescue helicopters	1 (8)	1 (8 S-61A)
Trainers	1 (15)	1 (15 T-17)
Antiaircraft missiles	8 (48)	8 (48 Improved Hawk)
Greece		
(24,000 persons, around 300 combat aircraft)		
Tactical fighters, attack aircraft and air defense fighters	15 (275)	3 (52 F-4E), 3 (54 F-104G), 2 (33 Mirage-F.1), 4 (83 F-5A & B), 3 (48 A-7H & 5 TA-7H)

Reconnaissance aircraft and land-based patrol aircraft	3 (36)	1 (12 RF-4E), 1 (12 RF-104G), 1 (12 HU-16B)[5]
Transport	3 (47)	1 (12 C-130H), 1 (6 YS-11, 14 CL-215), 1 (15 Noratlas)
Helicopters	3 (35)	1 (10 AB-205A, 3 AB-206A), 1 (8 UH-19D & 7 CH-47), 1 (2 AB-212, 5 Bell 47)
Special and auxiliary (including training)	. (over 150)	16 C-47 & Do-28, 59 T-33A, 20 T-41, 25 T-37, 36 T-2E
Antiaircraft missiles	4 (36)	4 (36 Nike-Hercules)
Turkey		
(57,400 persons, around 400 combat aircraft)		
Tactical fighter	14 (232)	4 (80 F-4E), 6 (72 F-104G), 2 (40 F-5A & B), 2 (40 F-100)
Air defense fighters	2 (40)	2 (36 F-104 & 4 TF-104)
Reconnaissance aircraft	2 (27)	1 (20 RF-5A & B), 1 (7 RF-4E)
Transport	6 (52)	1 (7 C-130E), 1 (20 C-160), 3 (22 C-47A), 1 (3 Viscount, 2 Islander & 2 C-47A)
Operational training	2 (28)	2 (4 F-104 & 24 F-5)
Special and auxiliary (including training)	. (around 250)	82 T-33A, 2 C-47A, 29 T-38, 40 T-41, 40 T-37, 12 T-34, 15 UH-1H, 5 UH-19B and others
Antiaircraft missiles	11 (96)	8 (72 Nike-Hercules), 3 (24 Rapier)
Spain		
(38,700 persons, around 200 combat aircraft)		
Tactical fighters	10 (179)	1 (24 F-18), 2 (32 F-4C, 4 RF-4C), 2 (18 Mirage-III), 3 (71 Mirage-F.1), 2 (21 F-5A & B, 9 RF-5A)
Land-based patrol	1 (6)	1 (6 P-3A)
Operational training	2 (23)	2 (23 F-5A & B)
Transport	8 (116)	1 (7 C-212, 2 Do-27), 6 (7 C-130H, 4 KC-130H[6], 6 C-207, 45 C-212, 30 DHC-4, 4 Falcon-20, 4 DC-8, 2 Boeing 707, 1 Falcon-50), 1 (4 C-212)
Special and auxiliary (including training)	. (over 350)	28 T-33, 24 T-44, 40 T-6, 86 C-101, 23 C-212, 3 F-27, 40 Do-27, 12 CL-215, over 30 other piston-engine aircraft and some 80 helicopters of different types
Portugal		
(14,500 persons, around 100 combat aircraft)		
Tactical fighters	4 (100)	2 (50 G-91), 2 (50 A-7P & TA-7P
Reconnaissance aircraft	1 (4)	1 (4 C-212)
Transport	4 (25)	2 (16 C-212), 1 (6 C-130), 1 (3 Falcon-20)
Special and auxiliary (including training)	10 (183)	1 (17 T-33A & 12 T-38A), 1 (24 T-37C), 2 (32 FTB-337G), 1 (30 DHC-1), 3 (56 Alouette-III), 2 (12 SA.330)

1. In addition to those given in the table, the U.S. Air Force (also including reserve components) has over 30 training squadrons and several test subunits with some 2,000 aircraft. In addition to this, there are over 900 aircraft of various types including 25 B-1B bombers and 12 FB-111's in the active depot reserve.
2. GLCM cruise missile flights.
3. Located at the joint conversion-training center in Cottesmore, Great Britain.
4. During reorganization of air defense forces and assets, the Nike-Hercules SAM systems are being replaced by Patriot systems. Short-range Roland SAM systems are becoming operational.
5. Obsolete American reconnaissance amphibious aircraft. Operate in the interests of the country's Navy.
6. Tanker aircraft, but used rather often as transports.

British Royal Navy

18010445k Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 89 (signed to press 10 Jan 89) pp 55-62

[Article by Capt 1st Rank V. Ivanov]

[Text] In supporting the Washington administration's course aimed at opposition to socialist countries, Great Britain's military-political leadership is attempting to reinforce its position in Western Europe and retain influence in other regions of the world. The Royal Navy serves as an important tool for conducting policy of the British bourgeoisie. The aggressive essence of that policy is clearly manifested in the nature of the Navy's employment and development. Ambitious plans for upgrading strategic sea-based nuclear forces permitting an increase in Great Britain's share of the NATO nuclear potential by almost tenfold (in case a treaty is signed between the USSR and United States for a 50-percent reduction in strategic offensive arms); open demonstrations of the Navy's capabilities for large-scale redeployments to remote parts of the world, particularly to area of the Falkland (Malvinas) Islands, in the course of regular exercises; and other measures with Navy involvement indisputably confirm the special role and importance of naval forces today and in the future.

As emphasized in a speech by the Navy chief of staff, the principal missions of the British Royal Navy in peacetime are to demonstrate NATO unity and readiness to "deter the USSR Navy"; actively participate in operational and combat training measures of bloc allied naval forces; ensure control over the most important ocean areas and over overseas territories; reconnoiter the Soviet Navy; ensure control over the East Atlantic area in a period of threat and with the onset of war; conduct antisubmarine warfare using ships, submarines and patrol aviation; reinforce NATO's northern flank by redeploying the Anglo-Dutch Marine brigade to Norway; and protect sea and ocean lines of communication.

In the opinion of the country's military-political leadership, in order to accomplish these missions the effective combat strength of naval forces must be maintained at the level of 200 ships, similar to the 600-ship makeup of the American Navy. At the present time, according to western press data, the Royal Navy has some 100 combatant ships of principal types (excluding minesweeping and patrol ships) and up to 100 large auxiliary vessels, which supports the Navy's needs on the whole. It is planned to maintain that quantitative makeup until the year 2000, constantly replacing and upgrading it qualitatively by building new, more advanced combatant ships and vessels.

Organization. Overall leadership of the country's Navy is exercised by the Secretary of State for Defence through the Naval Department (Fig. 1). The Department, headed by the Under-Secretary of State for Defence for the Royal Navy, includes the Naval Staff and main directorates for personnel; shipbuilding and armament; logistics; of the senior scientific adviser for the Navy; and of the assistant permanent under-secretary of state for defence for the Navy. The most important questions of Navy combat employment are considered in the Admiralty Board of the Defence Council, consisting of 11 members including the Navy chief of staff, his deputy, and chiefs of main directorates of the Naval Department.

The entity for immediate command and control of naval forces is the Naval Staff headed by the chief of staff, who is essentially the commander in chief of the Navy[1] as well as the chief adviser to the government and secretary of state for defence on naval matters, and a member of the chiefs of staff committee and of the higher certification committee. He is responsible for the Navy's state of combat readiness and for preparing and conducting operations (combat operations) at sea.

The chief of staff (First Sea Lord) directs the activity of staff bodies through his deputy and chiefs of directorates: plans; intelligence; combat employment of the Fleet, Naval Aviation and the Marines; operational requirements; operations planning for protection of ocean or sea lines of communication; signals; hydrography; security service; and chief of the naval history department. The chief of staff exercises control over naval arms through commands of the Fleet, Naval Aviation and Marines. In addition, commands on the territory of Great Britain and a training command as well as the commander of the Gibraltar Naval Area are directly subordinate to the navy chief of staff (Fig. 2).

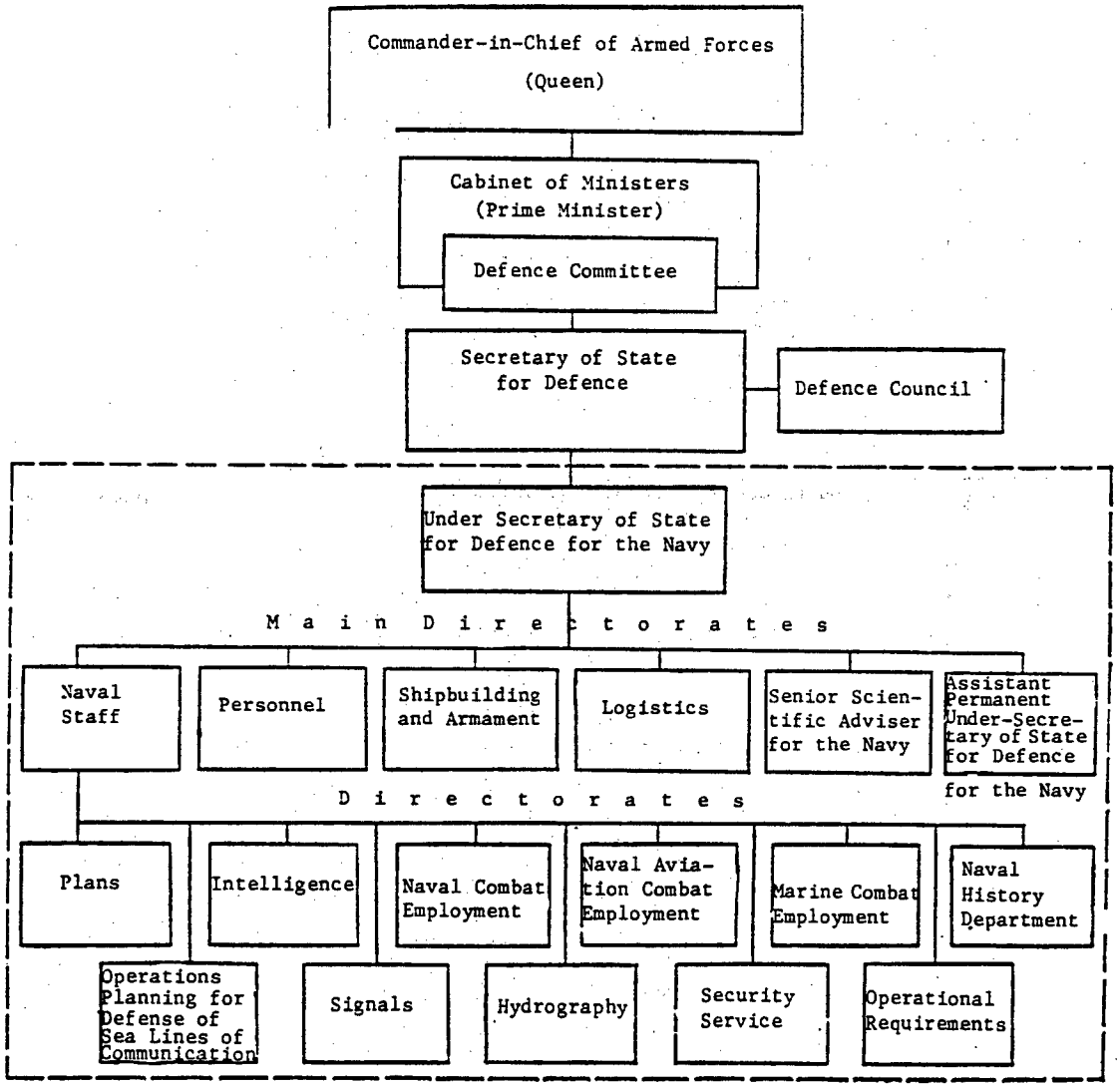
The *Fleet Command* includes a submarine flotilla, three flotillas of surface combatants (1st, 2d and 3d) and a mine warfare flotilla.

The submarine flotilla consists of the 10th Squadron of nuclear-powered missile submarines (four "Resolution"-Class SSBN's, Fig. 3 [figure not reproduced], based at the Faslane Naval Base); and the 1st, 2d and 3d squadrons of nuclear-powered multipurpose and diesel submarines assigned to the naval bases of Portsmouth, Devonport and Faslane respectively.

The 1st and 2d flotillas of surface combatants include four squadrons each (1st, 3d, 6th and 8th; 2d, 4th, 5th and 7th respectively) of destroyers and frigates assigned to the Portsmouth, Devonport and Rosyth naval bases; the 3d Flotilla includes light carriers ("Invincible," "Illustrious" and "Ark Royal"), assault ships ("Intrepid" and "Fearless"), air-capable training ships "Argus" (see color insert [color insert not reproduced]) and "Engadine," and special purpose ships "Challenger" and "Endurance."

The mine warfare flotilla has four squadrons of minesweepers (including one squadron of reserve ships) and a squadron of ships for fisheries protection and protection of oil and natural gas complexes, assigned to the Rosyth and Portsmouth naval bases.

Fig. 1. Organization of Naval Department of Great Britain



The *Naval Air Command* includes three squadrons of deck-based Sea Harrier FRS.1 fighter-attack aircraft, seven squadrons of ASW helicopters (Sea King-HAS.5) and three squadrons of multipurpose helicopters (Lynx-HAS.2 & 3), one squadron of Sea King-AEW.2 airborne early warning helicopters, three squadrons of Sea King-HC.4 assault transport helicopters, and up to ten squadrons of special and auxiliary aviation. In addition, four squadrons of land-based Nimrod patrol aircraft from the Royal Air Force are used in the Navy's interests.

Naval Aviation is stationed primarily at the air bases of Yeovilton, Culdrose and Portland, and Nimrod aircraft are based at Kinloss and St. Mawgan.

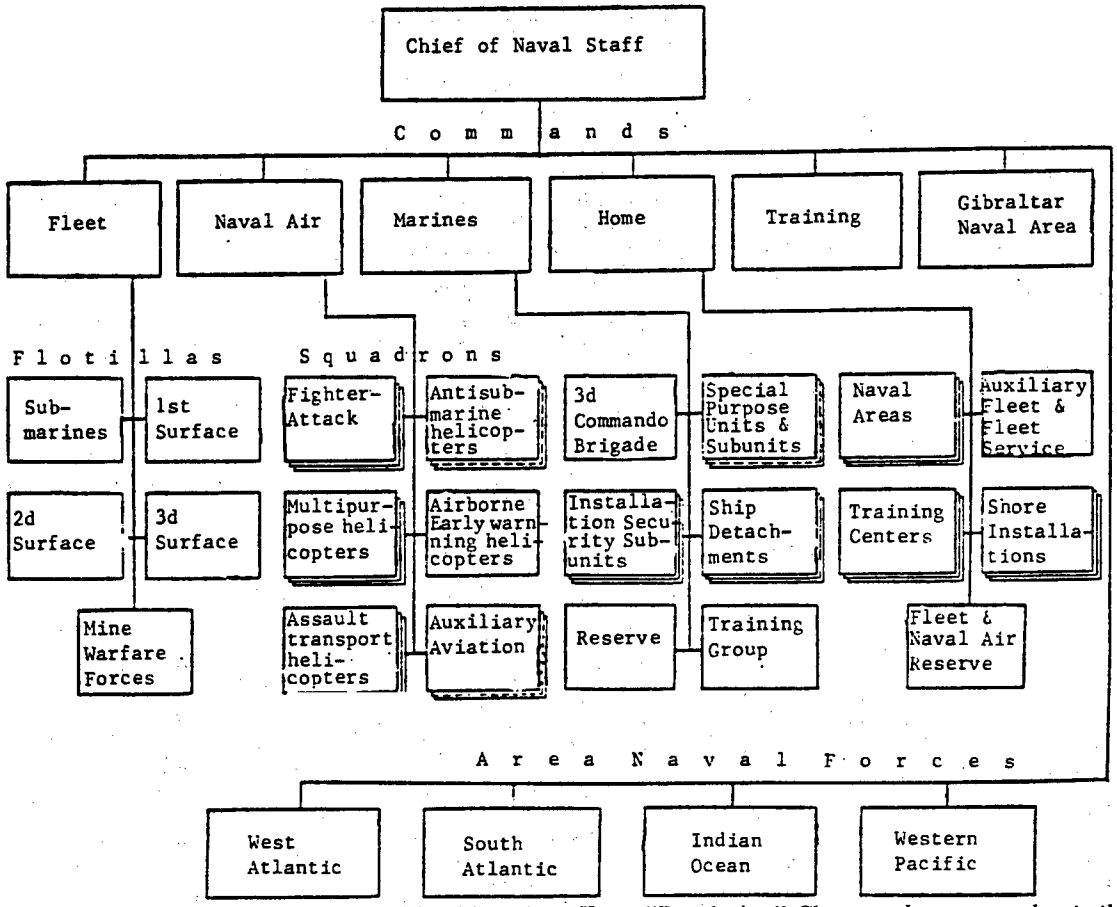
The *Marine Command*, headed by the Commandant of the Marines, includes the 3d Brigade (40th, 42d and 45th battalions, an artillery regiment, logistic regiment, a squadron of fire support helicopters, subunits of assault landing craft and auxiliary subunits)[2], as well as special purpose, installation security and reserve units and subunits, ship detachments of Marines, and a training group.

The *Home Command* is intended for comprehensive support of naval combat units. It includes shore installations, the auxiliary fleet and fleet service, training centers, naval reserve units and subunits, as well as naval areas with their infrastructure (Portsmouth, Plymouth and Scotland).

The *Training Command* organizes manpower acquisition for ship crews and provides for their training and the practice of operational training missions before ships are placed in the combat-ready naval forces.

The *Gibraltar Naval Area Command* is intended for supporting UK interests in this area. As a rule there are

Fig. 2. Organization of British Royal Navy



up to 5-10 combatant ships and vessels and land-based patrol aircraft here in peacetime using the Gibraltar Naval Base and Air Base.

The British Royal Navy also is present in the West Atlantic (Bermuda Islands) and South Atlantic (Falkland Islands), Indian Ocean, and Western Pacific (Hong Kong). Forces and assets in these zones are assigned from the Fleet, Naval Aviation, and Marine commands.

Effective combat strength of naval forces and prospects for their development. The Royal Navy, consisting of regular forces and a reserve, includes the Fleet, Naval Aviation, and Marines. The regular Navy numbers 67,300 persons, over 360 combatant ships and auxiliary vessels, around 400 aircraft and helicopters of combat and auxiliary aviation, and Marine forces (7,500 persons). The naval reserve has around 30,000 persons and 3,600 Marines. According to foreign press data, the Royal Navy ship order of battle is represented by ships of the following types: nuclear-powered missile submarines, nuclear-powered multipurpose and diesel submarines, light carriers, guided missile destroyers, guided missile frigates (frigates), landing ships, mine warfare ships and patrol ships.

Four "Resolution"-Class *nuclear-powered missile submarines* (S 22 "Resolution," S 23 "Repulse," S 26 "Renown" and S 27 "Revenge") are the only assets of the country's strategic offensive forces. Specifications and performance characteristics: surface displacement 7,600 tons, submerged displacement 8,500 tons; length 129.5 m, beam 10.1 m, draft 9.1 m; a PWR-1 15,000 hp nuclear reactor supports a surface speed of 20 knots and submerged speed of 25 knots. A crew of 143, including 13 officers. Armament: 16 Polaris-A3TK ballistic missiles with up to 600 KT MIRV re-entry vehicle with firing range of 4,600 km and six 533-mm torpedo tubes. "Resolution"-Class SSBN's were built during 1964-1969, and the cost of building four submarines was around 400 million pounds sterling.

In accordance with a decision made in 1982, by the mid-1990's four "Vanguard"-Class SSBN's will become part of the Royal Navy order of battle: "Vanguard"—lead, "Victorious," "Vengeance" and "Venerable," with a submerged displacement around 15,000 tons, length 148.3 m, beam 12.8 m, and draft 12 m. The PWR-2 nuclear reactor has an output of 27,500 hp. The "Vanguard"-Class SSBN's will be armed with American Trident II SLBM's with MIRV re-entry vehicles (8-14 warheads) and a range of fire of up to 12,000 km. Overall

cost of the Trident program is 9.9 billion pounds sterling, and commissioning of the lead SSBN is planned for 1992.

There are 16 *nuclear-powered multipurpose submarines* (SSN's) of the following classes in the Fleet order of battle: "Trafalgar" (five), "Swiftsure" (six) and "Valiant" (five).

The SSN's S 107 "Trafalgar," S 87 "Turbulent," S 88 "Tireless," S 90 "Torbay" and S 91 "Trenchant" have a surface displacement of 4,200 tons and a submerged displacement of 5,200 tons; the length is 85.4 m, beam 9.8 m and draft 8.5 m; the 15,000 hp nuclear reactor provides a submerged speed of up to 32 knots; a crew of 130. Armament: five 533-mm torpedo tubes (20 torpedoes on hand), as well as Harpoon antiship missiles. It is planned to commission another two submarines of this class, the S 92 "Talent" and S 93 "Triumph," in 1989 and 1991.

Development of a new class SSN, the SSN 20, has been under way since 1987. It is planned to place an order for building the lead submarine in the early 1990's.

Nuclear-powered submarines of the "Swiftsure" Class (S 126)—S 108 "Sovereign," S 109 "Superb," S 104 "Sceptre," S 105 "Spartan" and S 106 "Splendid," as well as of the "Valiant" Class (S 102)—S 103 "Warspite," S 46 "Churchill," S 48 "Conqueror" and S 50 "Courageous" built in the 1960's and 1970's differ little in specifications and performance characteristics from the "Trafalgar" SSN.

Diesel submarines (11 of the "Oberon" Class, S 10 and S 12-21 built in the 1960's) have a surface displacement of 1,600 tons, submerged displacement of 2,410 tons, submerged speed of 17 knots, range of 9,000 nm at a speed of 12 knots, and a crew of 70 including 7 officers. Armament: six 533-mm bow torpedo tubes (two aft tubes have been dismantled on some submarines and mothballed on others). Twenty-four torpedoes on hand.

New submarines of the "Upholder" Class (Type 2400, ten units) are being built to replace these submarines. The lead submarine (S 40) was commissioned in 1988 and the following ones—S 41 "Unseen," S 42 "Ursula" and S 43 "Unicorn"—are to be handed over to the Fleet in 1990, 1991 and 1993 respectively. It is planned to build the other six submarines before the mid-1990's. The "Upholder" has a submerged displacement of 2,455 tons, a length of 70.3 m, a beam of 7.6 m, a draft of 5.5 m, submerged speed of 20 knots, range of 8,000 nm (8 knots snorkel speed), and a crew of 44, including 7 officers. Armament: six 533-mm torpedo tubes (12 torpedoes, Harpoon antiship missiles).

The *light carriers* RO 5 "Invincible," RO 6 "Illustrious" and RO 7 "Ark Royal," commissioned in 1980, 1982 and 1985 respectively, are the largest surface combatants of the Royal Navy. The ships' standard displacement is 16,250 tons, length 209.1 m, beam at the waterline 27.5 m, draft 6.5 m, maximum speed 28 knots, and range 5,000 nm at a speed of 18 knots. The crew is 666, and an additional 402 are in the air group. Eight Sea Harrier aircraft, nine Sea King ASW helicopters and three Sea King-AEW.2 airborne early warning helicopters are accommodated aboard. If necessary, the air group composition can be changed for accomplishing other ASW missions not inherent to those practiced in exercises. For example, in the period of the 1982 Anglo-Argentine conflict in the South Atlantic, the light carrier "Invincible" operated with up to 12 Sea Harrier fighter-attack aircraft aboard in order to increase the force's striking power. The western press reports that ships of this class can be employed as helicopter carriers in an amphibious landing operation, in which case assault transport helicopters will operate in place of ASW helicopters, airlifting Marine subunits to the landing area.

Modernization of the RO 5 "Invincible" concluded in 1988, and as a result the ramp angle of inclination was increased from 7 to 12° and three Goalkeeper AAA systems were installed, as were new weapon control, communication, radar and sonar systems. It is planned to perform a similar modification on the light carrier "Illustrious" in the next few years.

Modern Royal Navy ships include 12 guided missile *destroyers* of the "Sheffield" Class (Type 42 built during 1976-1985: D 86 "Birmingham," D 87 "Newcastle," D 88 "Glasgow," D 108 "Cardiff," D 89 "Exeter," D 90 "Southhampton," D 91 "Nottingham," D 92 "Liverpool," D 95 "Manchester" (see color insert [color insert not reproduced]), D 96 "Gloucester," D 97 "Edinburgh" and D 98 "York." The standard displacement is 3,500 tons, full displacement 4,100-4,445 tons, length 125 m (141.1 for the D 95-98), beam 14.9 m, draft 5.8 m; a 50,000 hp power plant permits developing a speed up to 30 knots; range 4,000 nm at a speed of 18 knots. Armament: twin Sea Dart SAM system launcher (22 missiles on hand), 114-mm single gun mount, two 30-mm twin and four 20-mm single gun mounts, two 324-mm triple torpedo tubes, and a helicopter. A crew (depending on modification) of 253-301, of whom 24-26 are officers. Two ships of this class ("Sheffield" and "Coventry") were sunk by Argentine aviation during the 1982 Anglo-Argentine armed conflict.

The guided missile destroyer D 23 "Bristol" (Type 82), with a standard displacement of 6,300 tons (full displacement 7,100 tons) and the very same armament as ships of the "Sheffield" Class, has been a training ship since the middle of 1987.

Frigates (31 units) are numerous as a type of Royal Navy ship. The most modern are considered to be guided missile frigates of the "Broadsword" Class (Type 22): F 88 "Broadsword," F 89 "Battleaxe," F 90 "Brilliant," F 91 "Brazen," F 92 "Boxer," F 93 "Beaver," F 94

"Brave," F 95 "London," F 99 "Cornwall," F 96 "Sheffield," F 98 "Coventry" and F 85 "Cumberland." Construction of these ships continues. It is planned to commission another two in 1989: the F 86 "Campbeltown" and F 87 "Chatham." The standard displacement of "Broadsword" frigates (depending on modification) is 3,500-4,200 tons, full displacement 4,400-4,900 tons, length 131-146.5 m, beam 14.8 m, draft 6.4 m, and a crew of 220-270, including 30 officers. Armament: four single-container Exocet antiship missile launchers or two quadruple-container launchers for firing the Harpoon antiship missile, two Sea Wolf six-cell SAM launchers, two 324-mm triple torpedo tubes, 20-mm nd 40-mm gun mounts, and a helicopter.

"Amazon"-Class guided missile frigates—the F 169 "Amazon," F 171 "Active," F 172 "Ambuscade," F 173 "Arrow," F 174 "Alacrity" and F 185 "Avenger"—were transferred to the Navy during 1974-1978. They have a full displacement of 3,600 tons and are armed with antiship and antiaircraft missiles and torpedo and gun ordnance. Two ships of this class ("Ardent" and "Antelope") were destroyed during the 1982 Anglo-Argentine conflict over the Falkland (Malvinas) Islands.

Depending on armament, "Leander"-Class frigates are divided into several subgroups. The F 15 "Euryalus" and F 38 "Arethusa" have the Ikara antisubmarine guided missiles as the main armament; nine ships (F 45 "Minerva," F 47 "Danae," F 52 "Juno," F 127 "Penelope," F 57 "Andromeda," F 58 "Hermione," F 60 "Jupiter," F 71 "Scylla," F 75 "Charybdis") are armed with the Exocet antiship missile; and the F 12 "Achilles" and F 72 "Ariadne" are outfitted with 114-mm gun mounts.

In 1989 it is planned to commission the lead of four Type 23 guided missile frigates being built, the F 230 "Norfolk." Another three ships will be commissioned during 1991-1992. They have a standard displacement of 3,500 tons, antiship and antiaircraft missile weapons, and two helicopters. Their range is 7,800 nm at a speed of 15 knots.

Landing ships are intended for sealifting Marine units and subunits and landing them over the beach. The Royal Navy has ten landing ships: two assault ships (L 10 "Fearless" and L 11 "Intrepid"), six tank landing ships—five of the "Sir Bedivere" Class (L 3004 "Sir Bedivere," L 3027 "Sir Geraint," L 3029 "Sir Lancelot," L 3036 "Sir Percivale," L 3505 "Sir Tristram") and L 3005 "Sir Galahad" (Fig. 4 [figure not reproduced]), as well as two "Ardennes"-Class landing ships. The largest of them are the "Fearless" (in the naval reserve since 1986) and "Intrepid" assault ships, which can take aboard up to 1,000 Marines, 15 tanks, seven three-ton and up to 20 quarter-ton vehicles; five assault transport helicopters can be on the flight deck. "Sir Bedivere"-Class tank landing ships have a full displacement of 5,680 tons and are intended for sealifting over 500 Marines as well as 16 tanks and up to 34 pieces of wheeled equipment. They have a range of 800 nm at a speed of 15 knots. The tank landing ship "Sir Galahad" was commissioned in 1987, has a full displacement of 8,500 tons, and is capable of moving some 500 Marines with weapons and military equipment over a distance of 13,000 nm at a speed of 15 knots.

Mine warfare forces, which are not included by the Royal Navy command in the category of ships of main types in determining the Navy's 200-ship makeup, consist of 43 units (minesweeper/hunter, coastal and inshore minesweepers), including five ships in reserve. A series of "Sundown"-Class minesweeper-hunters is being built with a standard displacement of 450 tons. Construction of 20 such ships is planned.

Modern ships of this class are "Brecon"-Class minesweepers (M 29-M 41, Fig. 5 [figure not reproduced]) and "River"-Class minesweepers (M 2003-M 2014). Their full displacement is 750 and 890 tons respectively and they are equipped with sweeps of various types, remotely controlled submersibles, gear for hunting and destroying mines, and a 40-mm gun mount.

Patrol ships, intended for providing security of the 200-nm zone of fisheries and oil and gas complexes in the North Sea, also are not included in the category of combatant ships of main types. They have gun armament and if necessary can be easily refitted as ASW ships and also used for laying minefields. There are 16 patrol ships in the Fleet. The most modern of them are "Leeds Castle" (2), "Island" (7) and "Peacock" (5) classes.

The British Auxiliary Fleet includes up to 220 vessels for various purposes. They include supply vessels, transports, oilers, and tugs, organizationally consolidated in the Auxiliary Fleet and Royal Fleet Auxiliary Service.

The British *naval air fleet* numbers up to 40 Sea Harrier-FRS.1 fighter-attack aircraft as well as approximately 250 ASW, AEW, assault transport and auxiliary helicopters and around 80 trainer and auxiliary aircraft. Development plans provide for refitting deck-based aviation operating from "Invincible"-Class light carriers with more modern Sea Harrier-FRS.2 aircraft and new EH-101 helicopters of joint Anglo-Italian development, as well as modernizing Sea King ASW helicopters.

Naval basing system and logistic support. In the assessment of NATO military specialists, the British naval basing system and logistic support are capable of supporting execution of missions assigned to the Fleet, Naval Aviation and Marines in the bloc's zone of responsibility. There are six naval bases, two basing facilities and one forward U.S. Navy basing facility (Holy Loch) situated on the territory of Great Britain. Four naval bases—Portsmouth (main), Gosport, Portland and Devonport—are situated on the country's south coast, the Faslane Naval Base and Fairlie basing facility are on the northwest coast, Rosyth Naval Base is on the northeast coast and the Londonderry basing facility is in Northern Ireland. Naval bases and basing facilities have

sufficient capabilities for ship repair (dry and floating docks, covered ways and slips) and material-technical servicing (POL, ammunition and supply depots), including in the interests of NATO Allied Naval Forces.

An important element in the basing system for naval forces is the widely developed network of seaports with great capabilities for dispersal, for supporting military ocean and sea movements, and for repair and docking of combatant ships of practically all types. Major ports (with a freight turnover of up to one million tons per year or more) are characterized by high throughput capacity and outfitting with modern means of control and mechanization of loading and unloading operations, especially for receiving and processing containerships and RO/RO ships.

Manpower acquisition and training. Naval forces are manned by personnel from the recruitment of male and female volunteers 17 to 30 years of age who sign a contract for serving for a term of 9-12 years. After being selected and passing a medical board, new recruits take the oath and are sent to naval training centers, where they undergo basic training for three months. Then training continues in accordance with the chosen specialty. Depending on the specialty, the training period is 1-1.5 years, after which the rank-and-file are sent to ships and to units and subunits of the Marines and Naval Aviation.

Petty officers are trained at specialized naval training centers. The duration of training for petty officers from among servicemen is 4-6 months, and for those from among civilian youth without a special education it is 12-18 months. Petty officer training includes theoretical classes, simulator classes as well as OJT aboard ships and in naval units and subunits.

The officer corps is manned primarily by graduates of naval colleges at Dartmouth, Plymouth and Greenwich. Some regular naval officers are chosen from graduates of civilian higher educational institutions who have taken short courses at a naval college. Subsequent training of naval officers takes place at advanced qualification courses. Officer personnel are reassigned every 2-3 years as a rule, with provisions for alternation of duty aboard ships, in shore establishments and units both at home and abroad.

Naval operational and combat training is organized and conducted in accordance with views of the country's military-political leadership on combat employment of the Fleet, Naval Aviation and Marines, as well as with plans of the NATO bloc command. It is directed at increasing the combat and mobilization readiness of large and small units, upgrading the training level of staffs, and working out coordination of mixed forces, including within the framework of allied naval forces.

The principal major exercises of NATO Allied Naval Forces in which the Royal Navy usually takes part are Team Work, Ocean Safari, Joint Maritime Course, Open Gate, Bright Horizon and Norminex. The subject matter of exercises and nature of operations of Royal Navy ships and units in them indicate that special attention is given to problems of winning and maintaining sea supremacy and air superiority in the East and Iberian Atlantic, the North Sea and English Channel, as well as to supporting ocean and sea movements for reinforcing force groupings of NATO Allied Forces Europe. Great significance is attached to the training of mine warfare and landing forces.

Judging from the experience of the 1982 Anglo-Argentine conflict in the area of the Falkland (Malvinas) Islands, merchant fleet vessels in particular were widely used in the Navy's interests, including with the emergency refitting of some with containerized weapon systems, helicopters, and V/STOL aircraft. The western press emphasizes that the American Arapaho project for outfitting vessels of the civilian fleet with similar modular containerized systems essentially was realized by the British Navy in the course of this conflict. Some 2,200 vessels with a cumulative tonnage of over 8.5 million tons, of which up to 320 are containerships, are registered as part of the UK merchant fleet.

The information given above on the composition, status, basing system, support and direction of combat training of British naval forces indicates retention in the near future of the role of the Royal Navy as one of the most important foreign policy tools of the country's ruling circles.

Footnotes

1. The head of state (the Queen) is formally considered commander in chief of the Navy—Ed.

2. For more detail on the Marine brigade see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 10, 1985, pp 59-66—Ed.

New Norwegian Submarines

18010445l Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 89 (signed to press 10 Jan 89) pp 63-64

[Article by Capt-Lt I. Dalin]

[Text] Close contacts have been established between Norwegian and West German firms in the sphere of designing and building modern diesel submarines. This was facilitated by the signing of an agreement in September 1982 by the FRG and Norwegian defense ministers about the two countries' military cooperation. In connection with the agreement, the Norwegian side was

given responsibility for creating a new automated combat control system, generators, a storage battery and certain other components of the power plant for a new type submarine of the Norwegian Navy which the West German side undertook to develop. In addition, the FRG has to build the lead ship at the Thyssen Nordseewerke shipyard in the city of Emden and supply six sets of a sonar system, torpedo ordnance, periscopes and certain other equipment. Work on the project (designated 210/6071) was completed by late 1984. Thyssen Nordseewerke specialists used the Type TR 1000, to which appropriate changes and additions were made with consideration of the client's wishes, as a prototype in its development. The principal specifications and performance characteristics of Type 210/6071 submarines are given below.

Displacement, tons:	
Standard	940
Surface	1,040
Submerged	1,300
Principal dimensions, m:	
Maximum length	59
Beam (pressure hull diameter)	5.4
Mean draft	4.6
Maximum speed, knots:	
Submerged	23
Surface	11
Submergence (operating) depth, m	250
Caliber, mm x number of torpedo tubes	533x8
Crew	18-20

A distinguishing feature of their hull design is the X-shaped configuration of the aft rudders (Fig. 1 [figure not reproduced]). The power plant includes two MTU 16V 652 TB 91 diesels with turbo-supercharging with an overall output of 5,550 hp, two NEBB 870 kw generators, a 6,000 hp Siemens main propulsion motor, and an Anker 480-cell (4x120) storage battery (under license from the firm of Hagen). In the process of developing the power plant, special attention was given to improving vibroacoustic characteristics and ensuring the equipment's electromagnetic compatibility.

Armament of the Type 210/6071 submarine consists of 8 bow torpedo tubes and 14 DM-2A3 torpedoes (including 6 spares on racks) made by AEG. They are fitted with the new CSU-83 sonar system (NATO designation DBQS-21DN), developed by the West German firm of Krupp Atlas Elektronik. Successful tests of this sonar system were conducted in 1985 aboard an FRG Navy Type 206 submarine. It includes an echo-ranging sonar (operating frequency 8 kHz, operating range 9 km), a set (channel) for detecting sonar signals (1-100 kHz, 90 km), a passive panoramic sonar (0.3-12 kHz, 18 km), a channel for determining range to the target in the passive mode (2-8 kHz, 15 km), a sonar with towed extended antenna (0.01-0.8 kHz, 90 km), gear for determining target motion (0.01-2 kHz, 45 km), and a device for measuring internal noise with sensors mounted in the mast fairwater and in the engine compartment. A 1007 radar and SERO-14 and SERO-15 Karl Zeiss periscopes are used to cover the surface situation.

Electronics are consolidated within the MSI-90U[1] automated combat control system developed by the firm of A/C Kongsberg Zaapenfabrikk for the purpose of integrating and expanding capabilities of individual submarine subsystems. A characteristic feature of this system is realization of the concept of distributed processing of data coming from situation coverage subsystems, with its subsequent output in graphic form to operator multifunction console displays. The primary components of the MSI-90U are the KS-900F microcomputer, up to five KMC-9000 multifunction consoles, a BUDOS 32-bit multiplex data transmission line with four devices for interfacing with different shipboard subsystems. Software was developed using the Pascal language. Successful tests of the MSI-90U automated combat control system were conducted in 1986 under full-scale conditions and work began to create the first series model for the lead submarine.

Specialists of the Swedish firm of Saab were brought in to design submarine propulsion control equipment. They modified the main panel of the SCC-200 subsystem in accordance with the Norwegian side's demands (a contract for delivering six sets was signed in November 1984). The SCC-200 (Fig. 2 [figure not reproduced]) is intended for automatic and manual heading and depth control of the submarine, for changing her buoyancy and trim, and for changing the number of propeller revolutions. One operator exercises control of the submarine on shifting to the manual mode, while the automatic control mode is supported by gear created on the basis of the Intel 8086 microprocessor. A combined control mode also is possible.

Construction of the lead submarine, S 300 "Ula," presently is concluding. She was laid down in January 1987 and will be handed over to the Norwegian Navy in early 1989. The other submarines of this class (S 301 "Utsira," S 302 "Utstein," S 303 "Utvaer," S 304 "Uthag" and S 305 "Uredd") will become operational with the Norwegian Navy in the period from May 1990 through April 1992.

Footnotes

1. For more details about it see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 6, 1988, p 57—Ed.

New French Minesweeper/Hunter

18010445m Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 89 (signed to press 10 Jan 89) pp 64-66

[Article by Capt 1st Rank Yu. Petrov]

[Text] In developing a new series of minesweeper/hunters, the French Navy command rested its choice on a catamaran-hull ship (Type BAMO—*Batiment Anti-Mines Ocean*). The decision was made in May 1987 after comparing it with projects of air cushion vessels having a rigid side skirt and a hullborne vessel with conventional hull. They rejected them because of unsatisfactory characteristics in towing sweeps on the air cushion as well as large displacement and small upper deck area, especially aft, for the latter type. The new ships (see figure [figure not reproduced]) are to be used together with "Eridan"-Class minesweepers; they are to be assigned the missions of hunting mines at depths greater than 100 m (right up to the limits of the continental shelf) to ensure the safety of SSBN's exiting the Brest Naval Base.

The contract for building the lead ship ("Narvik") was concluded with the Direction des Constructions Navales firm. It is planned to build the ship at the Lorient shipyard. The firms of Thomson-CSF and ECA were chosen as mine warfare equipment suppliers. As the foreign press notes, the cost of building a series ship (320 million francs) should not exceed the cost of an "Eridan"-Class minesweeper, although she has considerably greater displacement.

The project envisages creating an integrated ship mine warfare system, including minehunting sonar, a precision navigation system, an automated combat control system specialized for mine warfare operations, a remotely controlled submersible for final reconnaissance and destruction of mines, and deep mechanical, acoustic and magnetic sweeps. According to conditions of open ocean operations, the ships must have high seaworthiness as well as increased endurance. The catamaran is less sensitive to rolling and has better maneuverability than conventional ships.

A composite material in the form of glass-reinforced plastic and polyester resin of single-layer construction with transverse frames and no stringers at all was chosen for the catamaran hull's shell. The superstructure, inner bulkheads and decks will have a double-layer construction of the same composite material and balsa wood. The ship will have a full displacement of around 900 tons, a length of 46 m, and overall beam of 15 m (each hull 5 m). The displacement is 19 percent less than for a single-hull ship with comparable principal dimensions. She has a crew of around 50.

It is planned to outfit the ship with a power plant consisting of two 1,360 hp diesels providing a speed up to 15 knots, and two low-noise electric motors of lesser output to be used during minehunting and sweeping (around 10 knots). These diesels and electric motors are connected in pairs through disconnecting clutches to two controllable-pitch propellers. The foreign press notes that it is planned to make the diesels of ferromagnetic materials. In addition to rudders, the ship will be fitted with two thrusters to improve maneuverability, which will help her maintain a given position with a strong wind, current and swell. The catamaran's greater metacentric stability compared with a conventional ship will allow rejecting stabilizer systems. Special efforts were made to reduce the level of the new minesweeper's physical fields (acoustic and magnetic above all). To test the chosen design solutions, the ship's hull midsection is being made at full scale (10 m long), and is to be tested for explosion and impact resistance.

The mine warfare equipment includes means for hunting, destroying and sweeping all kinds of mines, including the new DUBM-42 towed active side-looking minehunting sonar with a multilobe directional pattern. It was created to replace the DUBM-41 sonar of similar purpose and substantially surpasses it in a number of characteristics: towing speed 10 knots (as opposed to 4 knots), maximum towing depth of the array 300 (100) m, and scan width of the seabed surface to each side 200 (50) m. The DUBM-42 can be used with a sea state of up to 5. Its primary purpose is precise mapping of the channel seabed to ensure safety of SSBN escort. In conducting control inspections of channels, it permits easily detecting the appearance of suspicious objects on an area that has been mapped. It is not planned to process data coming from the DUBM-42 sonar aboard ship (cassettes with data recordings from it are to be sent to a shore analysis center for comparing and analyzing charts). It is planned to use a minehunting sonar with keel-mounted array for protecting the ship herself against mines.

A black-and-white and a color television camera, an explosive charge (100 kg) for detonating mines or a manipulator, as well as one device on each side for cutting mine moorings will be installed on the self-propelled, remotely controlled submersible for final reconnaissance and destruction of mines. It is planned to equip the submersible with the DUBM-60B sonar being developed for final reconnaissance of detected mines and similar objects.

Appropriate spaces for a deep mechanical sweep (at depths down to 300 m), acoustic sweep and magnetic sweep are reserved aboard ship for sweeping mines. It is also necessary to install an auxiliary winch on the minesweeper as a supplement to the minesweeping winch and crane in the aft end envisaged by the design.

The Thomson-CSF Lagadmor automated combat control system will be a very important component of the integrated mine warfare system. It is being created on the basis of a computer with a set of programs for solving problems of hunting, destroying or sweeping mines. Two

automated combat control system operator panels with multicolor displays will permit monitoring the characteristics of component subsystems. One display will show the overall tactical situation and the other will show data on the mine situation being transmitted from the ship sonar and remotely controlled submersible.

The number of "Narvik"-Class ships in the series will be up to 15. The lead ship already has been ordered and it is planned to finance the construction of four ships this year, to order another seven during 1989-1994, and to order the rest at a later time. It is planned to commission the first minesweeper in the early 1990's.

Effective Combat Strength of NATO Navies

18010445n Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 89 (signed to press 10 Jan 89) pp 66-72

[Reference data by Capt 1st Rank Yu. Kravchenko]

[Text] While actively building up the offensive potential of its armed forces, the North Atlantic Alliance military-political leadership devotes considerable attention to the development of naval forces, to keeping them in a high state of combat readiness, and to working out close coordination of the national navies of NATO member countries.

These tables, compiled from foreign press data, show the effective combat strength of naval forces as of the beginning of 1989.

Table 1—U.S. Navy Ship Order of Battle

Ship Type (Conventional Letter Notation)	Commissioned	Under Construction or Ordered (Being Modernized and Refitted	In Emergency Reserve (Mothballed)
1	2	3	4
	Submarines		
Nuclear-powered missile (SSBN)	36	7	-
Nuclear-powered (SSN)	99	18	(3)
Diesel (SS)	4	-	-
Total	139	25	(3)
Surface Combatants of Main Types			
Nuclear-powered carriers (CVN)	5	2	-
Carriers (CV, CVA)	9	(1)	(2)
Antisubmarine carriers (CVS)	-	-	(2)
Battleships (BB)	4	-	-
Nuclear-powered guided-missile cruisers (CGN)	9	-	-
Guided-missile cruisers (CG)	30	15	-
Cruisers (CA)	-	-	(2)
Guided-missile destroyers (DDG)	37	3	(2)
Destroyers (DD)	31	-	1(10)
Guided-missile frigates (FFG)	36	-	16(5)
Frigates (FF)	46	-	8(5)
Total	207	20(1)	25(28)
Landing Ships			
Command (LCC)	2	-	-
Amphibious assault (LHA, LHD)	5	3	-
Helicopter carriers (LHP)	7	-	-
Amphibious transport docks (LPD)	13	-	-
Dock landing ships (LSD)	11	6	(5)
Tank landing ships (LST)	18	-	2(3)
Amphibious cargo ships (LKA)	5	-	(1)
Total	61	9	2(9)
Mine Warfare Ships			
Mine countermeasures ships (MCM)	5	9	-
Minesweepers/hunters (MHC)	-	1	-
Ocean minesweepers(MSO)	3	-	18
Total	8	10	18
Small missile craft (PHM)	6	-	-

Table 1—U.S. Navy Ship Order of Battle

Ship Type (Conventional Letter Notation)	Commissioned	Under Construction or Ordered (Being Modernized and Refitted	In Emergency Reserve (Mothballed)
Flagships (AGF)	2	-	-
Auxiliary Vessels			
Underway replenishment vessels (AE, AFS, AO, AOE, AOR)	37	1	(1)
Material support vessels (AD, AS, AR)	24	-	(1)
Fleet support vessels (ARL, ARS, ASR, ATF, ATS)	17	-	3(5)
Other auxiliaries (AG, AGSS, AP, AVT, AVM)	2	-	(2)
Total	80	1	3(9)
Military Sealift Command (Authorized Ship Makeup)			
Vessels used in the navy as auxiliaries (T-AE, T-AF, T-AFS, T-AGDS, T-AGOS, T-AK, T-AO, T-ARC, T-ATF)	48	9	-
Oceanographic and hydrographic vessels (T-AGOR, T-AGS)	14	1	-
Vessels supporting sealifts in the interests of armed forces, depot ships, and other vessels for Marine expeditionary formations (T-AK, T-AKR)	21	(4)	-
Vessels for tracking flights of space objects and testing navigation systems (T-AG, T-AGM)	4	-	-
Total	87	10(4)	-
Grand total	590	75(5)	48(49)

Table 2—Ship Order of Battle of Navies of European NATO Countries and Canada

Ship Type	Great Britain	FRG	France	Italy	Canada	Belgium	Netherlands	Norway	Denmark	Greece	Turkey	Iceland	Portugal	Total
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Submarines:														
Nuclear missile	4 (2)[1]	—	6 (1)	—	—	—	—	—	—	—	—	—	—	10 (3)
Nuclear	16 (2)	—	4 (2)	—	—	—	—	—	—	—	—	—	—	20 (4)
Diesel	11 (3)	24	14	10 (2)	3	—	5 (4)	10 (6)	7	10	15	8	3	120 (15)
Surface Combatants of Principal Types:														
Aircraft carriers	3	—	2 (1)	1	—	—	—	—	—	—	—	2	—	8 (1)
Guided missile cruisers	—	—	1	2	—	—	—	—	—	—	—	—	—	3
Helicopter cruisers	—	—	1	1	—	—	—	—	—	—	—	—	—	2
Guided missile destroyers	13	7	15 (4)	4 (2)	(6)	—	—	—	—	6	2	—	—	47 (12)
Destroyers	—	—	1	—	4	—	—	—	—	8	10	8	—	31
Guided missile frigates	27 (9)	6 (2)	24 (3)	12	—	4	16 (8)	5	5	2	3 (1)	14 (1)	(3)	118 (27)
Frigates	4	2	1	4	16	—	—	—	5 (1)	5	4	—	17	58 (1)
Corvettes and patrol ships	16	6	10	11 (8)	—	—	—	15	—	—	—	7	—	65 (8)
Landing Ships:														
LST's, amphibious transport docks, dock landing ships, transports	10	—	8 (1)	2 (1)	—	—	—	—	—	13 (5)	7	5	—	45 (7)
Small landing craft	—	22[a]	8	—	—	—	—	7	—	—	36	3	3	79
Mine Warfare Ships:														
Minesweepers, minesweeper/hunters	43	55 (10)	25 (1)	37	—	29 (4)	26 (1)	8 (10)	6	14	26	12	4	275 (26)
Minelayers	—	2	—	—	—	—	—	3	6	2	6	—	—	19
Small Combatants:														
Missile	—	40	—	8	—	—	—	38	10	14	15 (1)	—	—	125 (1)
Torpedo	—	—	—	—	—	—	—	8	6	5	4	—	—	23
Patrol	7	—	12	—	—	—	—	2	30 (15)	10 (2)	27	32	18	138 (17)
Total	154 (16)	164 (12)	132 (13)	82 (13)	23 (6)	33 (4)	47 (13)	96 (16)	75 (16)	89 (7)	155 (2)	91 (1)	45 (3)	1188 (122)
Auxiliary Vessels & Craft	222 (2)	112	201 (3)	140	47 (4)	14	37	28	33	37	93	92	12	1068 (9)
Grand Total	376 (18)	276 (12)	333 (16)	222 (13)	70 (10)	47 (4)	84 (13)	124 (16)	108 (16)	126 (7)	248 (2)	183 (1)	57 (3)	2254 (131)

Key:
1. The number of ships under construction as well as of those for which orders have been placed for construction are given in parentheses (here and further).
2. Here and further on this line, ships with a full displacement of from 400 to 1,000 tons.

Table 3—Air Order of Battle of NATO Country Navies

Air Arm, Aircraft and Helicopters	Number of Squadrons (Aircraft and Helicopters in Them)	Including
1	2	3
United States of America[1]		
(Regular forces)		
Aircraft	161 (1,713)	
Helicopters	57 (802)	
Fleet Carrier Aviation:		
Aircraft	103 (1,011)	
Helicopters	26 (272)	
Attack	27 (294)	15 (150 A-6E Intruder), 12 (144 A-7E Corsair)
Fighter-attack	17 (216)	17 (216 F/A-18A Hornet[2])
Fighter	22 (264)	22 (264 F-14A Tomcat[2])
Antisubmarine:		
Aircraft	13 (130)	13 (130 S-3A & B Viking)
Helicopters	24 (248)	13 (78 SH-3D & H Sea King), 6 (90 SH-2F Seasprite), 5 (80 SH-60B Seahawk)
Reconnaissance (AEW, EW, reconnaissance aircraft)	24 (107)	13 (52 E-2C Hawkeye), 11 (55 EA-6B Prowler)
Mine countermeasures helicopters	2 (24)	2[3] (24 RH-53D Sea Stallion & MH-53E Sea Dragon)
Land-based fleet aviation:		
Aircraft	26 (250)	
Land-based patrol	24 (216)	24 (216 P-3C Orion)
ELINT	2 (34)	2 (22 EA-3B Skywarrior[4], 12 EP-3E Orion)
Marine aviation:		
Aircraft	32 (452)	
Helicopters	31 (530)	
Attack	13 (206)	5 (50 A-6E Intruder), 4 (76 A-4E Skyhawk), 4 (80 AV-8B Harrier II)
Fighter-attack	12 (144)	7 (84 F/A-18A Hornet), 5 (60 F-4J & S Phantom II)
Reconnaissance (EW, reconnaissance, artillery observer)	7 (126)	1 (24 EA-6B Prowler), 1 (21 RF-4B Phantom), 3 (21 OA-4M Skyhawk), 2 (36 OV-10 Bronco, 24 UH-1E Iroquois helicopters)[5]
Assault transport	28 (434)	4 (64 CH-53E Super Stallion), 7 (112 CH-53A & D Sea Stallion), 14 (210 CH-46F Sea Knight), 3 (48 UH-1N Iroquois)
Fire support helicopters	3 (72)	2 (48 AH-1T Sea Cobra), 1 (24 AH-1W Super Cobra)[5]
United Kingdom[6]		
43 combat aircraft, around 180 combat helicopters)		
Fighter-attack aircraft	3 (43)	3 (38 Sea Harrier-FRS.1, 3 Sea Harrier-T.4 & 2 Hunter-T.8)
Helicopters:		
Antisubmarine	7 (77)	7[7] (77 Sea King-HAS.5)
Multipurpose	3 (84)	3[7] (84 Lynx-HAS.2 & 3)
AEW	1 (10)	1 (10 Sea King-AEW.2)
Assault transport	3 (33)	3[7] (33 Sea King-HC.4)
Fire support	1 (16)	1 (12 Lynx & 4 Gazelle[8])
Special and auxiliary (including trainer)	105	20 Jetstream, 22 Gazelle, 5 Sea Heron, 14 Chipmunk, 10 Canberra, 26 Hunter and 8 Falcon
FRG[6]		
112 combat aircraft, 14 combat helicopters)		
Fighter-bombers	4 (78)	4 (78 Tornado)
Reconnaissance aircraft, including EW aircraft	2 (25)	1 (20 Tornado), 1 (5 Atlantic)
Land-based patrol aircraft	2 (14)	2 (14 Atlantic)
ASW helicopters	1 (14)	1 (14 Lynx)

Table 3—Air Order of Battle of NATO Country Navies

Air Arm, Aircraft and Helicopters	Number of Squadrons (Aircraft and Helicopters in Them)	Including
1	2	3
Special and auxiliary (including trainer)	42	20 Do-28D, 22 Sea King[9]
France[6]		
(Around 150 combat aircraft, 38 combat helicopters)		
Fighter-attack aircraft	3 (64)	3 (64 Super Etendard)
Fighters	1 (23)	1 (23 F-8E Crusader)
Reconnaissance aircraft	1 (8)	1 (8 Etendard-4P)
ASW aircraft	2 (21)	2 (21 Alize)
Land-based patrol aircraft	4 (32)	4 (32 Atlantic)
Helicopters:		
Antisubmarine	3 (38)	3 (38 Lynx)
Assault transport	1 (17)	1 (17 Super Frelon)
Special and auxiliary	Around 180	Light transport, liaison, search and rescue, training aircraft and helicopters
Italy		
(18 combat aircraft, 98 combat helicopters)		
Land-based patrol aircraft	2 (18)	2 (18 Atlantic)
ASW helicopters	5 (98)	2(36 Sea King), 3 (62 AB.212 ASW)
Canada		
(33 combat aircraft, 35 combat helicopters)		
Land-based patrol aircraft[10]	4 (33)	3 (18 CP-140 Aurora), 1 (15 CP-121 Tracker)
ASW helicopters[10]	2 (35)	2 (35 CH-124 Sea King)
Belgium		
Helicopters[10]	1 (8)	1 (5 Sea King, search and rescue service, 3 Alouette III)
Netherlands		
15 combat aircraft, 17 combat helicopters)		
Land-based patrol aircraft	2 (15)	2 (13 Atlantic, 2 F.27 Maritime)
ASW helicopters	1 (17)	1 (17 SH-14B & C Lynx)
Special and auxiliary	1 (5)	1 (5 UH-14A Lynx, search and rescue service)
Norway		
(7 combat aircraft)		
Land-based patrol aircraft[10]	1 (7)	1 (7 P-3B Orion)
Helicopters[10]	2 (16)	1 (10 Sea King, search and rescue service), 1 (6 Lynx)
Denmark		
Helicopters[10]	1 (17)	1 (8 Sea King, search and rescue service, 9 Lynx, coast guard)
Greece		
(12 combat aircraft, 22 combat helicopters)		
Land-based patrol aircraft[10]	1 (12)	1 (12 HU-16 Albatros)
ASW helicopters	3 (22)	2 (18 AB.212 ASW), 1 (4 Alouette III)
Turkey		
(20 combat aircraft, 9 combat helicopters)		
Land-based patrol aircraft	1 (20)	1 (2 S-2S & 18 S-2E Tracker)
ASW helicopters	1 (9)	1 (6 AB.212 ASW, 3 AB.204E)
Spain		
(22 combat aircraft, 46 combat helicopters)		

Table 3—Air Order of Battle of NATO Country Navies

Air Arm, Aircraft and Helicopters	Number of Squadrons (Aircraft and Helicopters in Them)	Including
1	2	3
Fighter-attack aircraft	2 (22)	1 (8 AV-8A Matador & 2 TA-8A), 1 (12 AV-8B Harrier)
Land-based patrol aircraft[10]	1 (6)	1 (6 P-3A Orion)[11]
Helicopters:		
Antisubmarine	3 (42)	1 (14 SH-3D Sea King), 1 (11 AB.212 ASW), 1 (11 Hughes 500 MD Defender), 6 Seahawk
Fire support	1 (4)	1 (4 AH-1G Huey Cobra)
Special and auxiliary	17	6 liaison aircraft, 11 AB.47G training helicopters

1. The table shows the authorized strength of combat squadrons. It should also be borne in mind that some 67 out of 100 percent of purchased aviation equipment goes directly to combat squadrons, 15 percent for operational training, 2 percent for testing, and approximately 15 percent is listed in the reserve for combat squadrons. It is intended for maintaining high combat readiness of aviation equipment of combat squadrons as well as to make up for losses from accidents and crashes and for replacing aircraft and helicopters which have used up their service life.
   In addition to those shown in the table, the organized U.S. Naval Air Reserve has some 70 squadrons (over 800 aircraft and helicopters). In addition, the flight personnel training command has more than 900 flying craft (around 20 squadrons). The depot reserve of U.S. naval aviation at Davis Monthan Air Force Base (Arizona) is 1,000 aircraft and helicopters, half of which can be used in an emergency.
2. Including 12 F/A-18A and 36 F-14A adapted for flights with the TARPS suspended pod reconnaissance system.
3. Activation of a third squadron of mine countermeasures helicopters presently is under way in the Atlantic Fleet (Norfolk Air Base).
4. Landings of EA-3B aircraft on carriers which are part of forward forces ceased in 1987.
5. It is planned to form composite squadrons from UH-1E artillery observer helicopters and AH-1T & W fire support helicopters.
6. Counting training and operational training craft as well as the reserve for squadrons.
7. Including one operational training squadron.
8. Part of the 3d Marine Brigade.
9. Search and rescue helicopters, armed with British Sea Skua antiship missiles.
10. Part of Air Force, but operationally subordinate to the Navy.
11. Five P-3B Orion aircraft purchased in Norway, which will replace the P-3A after modernization.

Military Industry in Scandinavian Countries

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[Part One of article by Capt 1st Rank Yu. Shitov]

[Text] The group of Scandinavian countries, immediate neighbors of the Soviet Union, is associated by many geographical, historical and cultural factors, but these are largely different states according to the foreign policy course being followed. Here we see a neutral Finland adhering to a balanced policy between East and West, three countries—Denmark, Norway and Iceland—that are members of the aggressive NATO bloc, and traditionally neutral Sweden, oriented basically toward the western countries. This article examines the military aviation of Sweden, Denmark and Norway, which plays a specific role in this region's military-strategic position.

Sweden

Situated in Northern Europe, the Kingdom of Sweden has followed a policy of neutrality and noninvolvement in military blocs since 1814. Although Sweden's neutrality officially has not been fixed in any international documents, the words "Sweden" and "neutrality" stand side by side in the awareness of the majority of people. At the same time, the traditional neutrality does not hinder the country from having rather powerful armed forces equipped with modern weapons and numbering some 65,000 persons. They can grow in a short time by more than tenfold in case of mobilization.

The armed forces are equipped with 70-80 percent of weapons and military equipment from products of Sweden's own manufacture. According to official statistics (materials of the "Swedish Peace and Arbitration Association," 1986), some 250 industrial enterprises engage in producing military products, but 11 of the largest ones account for over half of the military production volume. The table gives a brief description of ten of the leading firms putting out military products.

Leading Swedish Firms Manufacturing Military Products

Firm	Number of Persons Engaged in Military Production (Percentage of Total Number Employed in the Firm)	Annual Production Volume of Military Products, Millions of Swedish Kronor
L. M. Ericsson, Radio Systems Division	2,900(64.5)	3,000
Bofors	4,606(85)	2,939
FFV	2,597(100)	669
Philips, Electronic Industries Division	1,140(.)	1,738
Kockums Marine	800(100)	1,700
Volvo Flygmotor-SAAB-Scania	2,398(.)	713
SAAB-Scania, Aircraft Division	5,428(81)	1,572
Karlskronavarvet	500(43)	403
Haegglund ok Soener	1,167(40)	255
SATT Electronics	150(23)	252

A total of over 23,500 persons work in Sweden's military aviation (63 percent are employed at enterprises putting out military products), and the annual production volume is over 16.5 billion Swedish kronor.

Coordination of military production is the responsibility of the ministries of Industry and Defense. The so-called "Military Aviation Association," which the firms given in the table also entered, was established in early 1986 with the objective of improving coordination of activities of individual firms and improving their competitive ability in the international market.

The country's military aviation is characterized by a high level of production, modern technological equipment, presence of a reserve of production capacities, and high qualification of specialists.

Developments of new weapon and military equipment models are financed both by the state (around one-third of the amount in monetary terms) and by private firms. There were 2,606,000,000 Swedish kronor directed toward purely military research in 1986, which was 23 percent of the cost of all R&D. Leading military manufacturers spend considerable sums creating new weapons. For example, the firms of L. M. Ericsson and SAAB-Scania put 9 and 8 percent of their turnover respectively into this business. Military S&T cooperation with foreign states, and above all with NATO countries, is expanding.

Swedish firms engaged in military production are characterized by a multiprofile nature and by involvement in the development and manufacture of different kinds of weapons and military equipment. Therefore the very same firms or their joint ventures and temporary associations often will be encountered in examining individual sectors of military aviation.

Sweden's **aviation industry** is one of the most developed sectors of national military aviation. According to official Swedish statistics, there are 32 industrial enterprises in the aviation industry with 16,400 employees. The leading ones among them are plants of the firms of SAAB-Scania (Aircraft Division), Volvo Flygmotor, SACAB (Scandinavian Aircraft Construction AB), and FFV Aerotech, which account for 90 percent of aviation products manufactured in the country and 60 percent of persons employed in the sector. Some 40 percent of products are exported. At the same time, 40-50 percent of set-completing assemblies and components are imported primarily from the United States, Great Britain, the FRG and Italy.

The history of aircraft construction in Sweden goes back over a half-century. The small firm of Svenska Aeroplan AB (SAAB) was established in 1937 to produce military aircraft. Two years later it merged with the Aircraft Division of the Rolling Stock Factory in the city of Linkoping. The head office of the aircraft construction personnel at that time was in this small city in the central part of Sweden. The scope of aircraft construction rose especially in postwar years, when a production wing was built here with an area of 25,000 m^2. In 1968 SAAB merged with the firm of Scania-Vabis, resulting in formation of the SAAB-Scania concern. In the 20 years of its existence some 4,000 aircraft of various types have been produced (including over 2,000 military jets) along with 1,500 aircraft piston engines. In addition to its own aircraft equipment, assemblies and parts are manufactured here for the American MD-80, -82 and -83 aircraft (developed by McDonnell Douglas). Since 1962 SAAB-Scania has been an agent of the well-known American helicopter construction company of Hughes Helicopters for the sale and service of helicopters in Scandinavian countries.

Swedish SF-340A airliners with two turboprop engines manufactured in cooperation with Fairchild Industries (USA) have been in demand on the world aircraft equipment market. Market prospects for this cargo and passenger aircraft are assessed as favorable over the next 10-15 years. Over 120 aircraft had been ordered by 1987, of which some 100 already have been delivered.

A long-range radar warning and control aircraft is being created based on the SF-340A. The Ministry of Defense

allocated 73 million Swedish kronor to develop equipment. The aircraft is expected to become operational in 1990. The equipment already has been developed, particularly an external antenna, the PS-890 surveillance radar of the firm of L. M. Ericsson, and other equipment, with tests taking place in the United States.

The firm is most well-known for and gets no small income from the production of combat aircraft. Production of the SAAB-35 Draken fighter began in 1958 and it remained in production for many years. In addition to the Swedish Air Force, this aircraft became operational in Finland, Austria and Denmark. A total of over 600 such aircraft were produced.

In 1987 the Swedish Air Force began to receive a modernized version of the Draken fighter, designated the SAAB-35J and distinguished from the SAAB-35F by the presence of pylons for several air-to-air guided missiles. The aircraft is equipped with new SAAB-Scania electronics, and the association of state plants known as FFV (FFV—Foerenade Fabriksverken) is developing an automatic aircraft cannon for this model. It is planned to produce up to 50 combat aircraft under this program. The objective of this program is to extend the life cycle of Draken fighters until the mid-1990's, when the JAS-39 aircraft will begin to come into the inventory.

The first flight of the AJ-37 Viggen multimission aircraft in February 1967 showed that SAAB-Scania can create modern combat aircraft which concede nothing in characteristics to foreign models. With a maximum take-off weight of 17-20 tons, the aircraft is capable of taking off and landing on unprepared airfields with a landing run of no more than 500 m. It is equipped with the RM8C jet engine (maximum thrust 7.2 tons, afterburning thrust 12.5 tons), produced by the Swedish firm of Volvo Flygmotor based on an engine of the American firm of Pratt & Whitney. On-board electronics consists of 50 different instruments with an overall weight of 600 kg, controlled by computer. Depending on the purpose (AJ-37 fighter-bomber, JA-37 fighter-interceptor, Fig. 1 [figure not reproduced]), SF-37 reconnaissance aircraft, SH-37 naval reconnaissance aircraft, SK-37 trainer), the aircraft is armed with a built-in 30-mm aircraft cannon of the Swedish firm of Oerlikon, and on external attachment points can carry two Sky Flash (Swedish designation RB 71) and four Sidewinder (RB 24) air-to-air missiles produced by SAAB-Scania under British and American licenses respectively, and 24 135-mm rockets for engaging ground targets.

The production program envisages output of 329 aircraft. Viggen gave serious competition to French and American aircraft in the early 1970's, when several West European countries (Denmark, the Netherlands, Norway, Belgium) were choosing a common fighter for their armed forces. The choice fell on the F-16 in those years.

In recent years specialists' attention has been drawn by the new generation JAS-39 Gripen[1] aircraft being developed (Fig. 2 [figure not reproduced]), which borrowed many positive characteristics from the Viggen: low weight (a design maximum take-off weight of 8-9 tons), short take-off run, reliability and convenience of maintenance. Latest achievements in the sphere of aircraft construction will be embodied in the new aircraft's design—wide use of composite materials and the installation of an electro-remote aircraft control system and electronic sights. Thirty-five on-board computers will help the pilot. As a result, in the opinion of this aircraft's designers, a small, light multi-role aircraft will be created, but with powerful armament and capable of taking off and landing on dirt roads and requiring minimum servicing. Armament of the JAS-39 will vary depending on combat purpose—several types of air-to-air missiles, RBS 15 antiship missiles, cluster bombs, 27-mm aircraft cannon of the West German firm of Mauser, and other armament.

The first prototype of the Gripen left the plant building on 26 April 1987 and the first test flight took place in the summer of 1988. According to the program for development and production of this aircraft, it is planned to begin to become operational with the Swedish Air Force in 1992. The JAS-39 will replace Viggen aircraft initially in the fighter-bomber (AJ-37) version, and then the fighter-interceptor (JA-37) and reconnaissance (SF-37) versions. Subsequently they will replace the modernized SAAB-35J Draken fighters.

The production program for the new aircraft envisages the output of 140 aircraft (in the opinion of Swedish specialists, 280-300 Gripen aircraft will be required to replace the entire aircraft fleet of the Swedish Air Force before the year 2015). The development and production program tentatively will cost 42 billion Swedish kronor (seven billion U.S. dollars). This is the largest military contract in the history of Swedish industry. Many leading European and overseas firms are taking part in realizing it. Swedish specialists note that implementation of the Gripen project will contribute to drawing neutral Sweden further into military aviation cooperation with the United States and other NATO countries. SAAB-Scania will try to obtain export orders to compensate for expenditures connected with developing the aircraft and organizing its production. Even now Switzerland, Denmark, Spain and other countries are showing an interest in this aircraft.

The firm of Volvo Flygmotor with head office in the city of Trollhaettan is the monopoly producer of **aircraft engines**. The bulk of output consists of power plants for military aircraft. Production began in 1930 with the Flygmotor firm's creation of the Pegasus I engine under license from the British firm of Bristol. In 1970 Flygmotor was swallowed up by the more powerful Volvo concern. By this time the proportion of Flygmotor's military products was around 90 percent. Although subsequently it dropped to 40 percent as a result of an

expansion in the product list of articles being manufactured, engines for military aviation are the basis of production. Growth not only is following the path of the firm creating its own developments, but also as a result of collaboration and cooperation with such very large world aircraft engine building firms as General Electric and Pratt & Whitney (USA), Rolls-Royce (UK) and others. A so-called "Swedish model" of engine building has been created, where the firm not only develops and produces engines, but also engages in their repair and modernization throughout the entire life cycle.

In recent years the principal engine manufactured by Volvo Flygmotor has been the RM8 (several modifications) with an afterburning thrust of up to 12.5 tons and weighing 2,250 kg. But when production of Viggen aircraft stopped in 1988, production of the RM8 also ended. The RM12 engine (Fig. 3 [figure not reproduced]), created for the new JAS-39 Gripen aircraft, will take its place in the firm's production buildings. This engine was developed together with the American firm of General Electric on the basis of the F404 engine installed in F/A-18 Hornet, F-20 Tigershark, the experimental X-29 and other aircraft. As a result of modifications to the base engine, its thrust increased from 7.1 to 8.0 tons. Subsequently it is planned to increase it to 10 tons. The American firm will produce 65 percent of engine parts and the Swedish firm 35 percent, and the latter will assemble the engine. The Swedish party will deliver other engine components to the United States as payment for certain imported assemblies.

In addition to developing and producing engines for military aviation, Volvo Flygmotor collaborates with General Electric, Pratt & Whitney, and Garrett (USA) in developing and producing individual components for other modern aircraft engines. Since 1960 the firm's activity also has expanded in the sphere of creating rocket engines for guided missiles. The Swedish firm is taking part in creating engines for the Ariane IV and V booster rockets together with the SEP French state company for rocket engine production and the West German concern of MBB (Messerschmitt-Boelkow-Blohm).

Working in such a technically sophisticated and science-intensive sphere as aircraft engine building and under conditions of growing fierceness of competition from more powerful foreign competitors, Volvo Flygmotor gives constant attention to the technical upgrading of its products and an improvement in production indicators. A large detachment of highly qualified specialists works here. Over 15 percent of the almost 4,000 firm employees are engaged in the sphere of R&D. The firm has eight test beds, several wind and water tunnels, test units and other modern equipment. Results of tests on these units are automatically sent to a main computer center.

In recent years Swedish military aviation mastered production of modern **missile weapons** of various classes. This did not involve copying models or attempting to catch up with other countries which had succeeded in this sphere. The most well-known Swedish missile systems are the antitank RBS 56, antiaircraft RBS 70 (Fig. 4 [figure not reproduced]) and antiship RBS 15. The foreign press notes that the RBS 56 Bill antitank missile system generated interest in the armed forces of many western countries. It has been under development since 1979, and deliveries to the Swedish armed forces began in 1988. The missile's primary advantage is that it engages an armored target from above, where the latter has the weakest armor. The system also uses a night sight, which broadens its combat capabilities. The firm of Bofors, which put over 400 million Swedish kronor into developing the RBS 56, is counting on receiving large orders for its production. Successful tests of this antitank missile system against fixed and moving (speed of 10 m/sec laterally) targets at a range of 2,000 m also were conducted in the United States.

The RBS 70 antiaircraft missile system developed by Bofors and put into production in 1978 proved to be a rather effective means of engaging airborne targets at altitudes up to 3,000 m and at a range up to 5,000 m. At the present time it is being manufactured in various versions—portable and mobile, mounted on motor vehicles, APC's, ships and other mobile platforms. It is guided to the target along a laser beam. The system can operate both autonomously or from an external radar (such as the PS-70/R Giraffe radar produced by the firm of L. M. Ericsson). In addition to the Swedish armed forces, the RBS 70 is being supplied to many countries such as Norway, Australia, Ireland and Singapore (and through it also to certain others). Purchasers of the Swedish SAM system are attracted by its small weight and size characteristics (the missile with container 152 mm in diameter and 1.6 m long weighs 24 kg), its quality, simplicity of servicing and reliability of hitting targets.

The RBS 15 antiship missile system, which received specialists' recognition, began to be developed in 1979 (immediately after rejection of the purchase of American Harpoon antiship missile systems) by two leading Swedish firms—Bofors and SAAB-Scania. Work was carried on to create two versions of the antiship missile, air-launched and ship-launched, at the same time. At the present time production of the RBS 15 antiship missile system is taking place within the framework of the SAAB-Bofors Missile consortium. This system is used to arm "Spica"-Class (12 units) and "Stockholm"-Class (2) fast attack missile craft. It is also being sold for export. The air-launched antiship missile initially was tested on Viggen aircraft, but subsequently it is also planned to arm the JAS-39 Gripen with it. The missile weighs 620 kg (with container 800 kg), is 4.35 m long, and has a diameter of 0.5 m. The flight range is up to 70 km at a speed of Mach 0.8. In June 1986 the Swedish Ministry of Defense concluded a contract with the consortium for developing a new version of the RBS 15 intended for employment by coastal defense units. Basing is to be

stationary or mobile (on motor vehicles). According to Swedish press reports, tests of this model have been successful.

Work continues in Sweden to create air-to-air missiles which are to become part of the armament of JAS-39 Gripen aircraft. The leading projects envisage creation of three types of guided missiles. The medium-range RB 71A missile is being created by the aforementioned consortium together with British firms of British Aerospace and Marconi and the Swedish firm of L. M. Ericsson based on the British Sky Flash missile. The RB 73 will be a version of the RB 71A missile with an increased range of fire. The third missile—SAIR (Swedish Advanced Infra-Red)—equipped with an infrared homing system is being developed by the SAAB-Scania firm independently and is intended for conducting close-in air-to-air combat.

The Bofors concern holds a special place in Sweden in the **production of artillery weaponry**. Its interests additionally include the spheres of electronics and missile weaponry and the production of ammunition and mines.

The Bofors Ordnance firm, which is part of the concern, engages in producing artillery systems of various calibers. The firm's first postwar development was a 105-mm gun created on the basis of a prewar Czechoslovak model. Work on it was halted after lengthy development and tests which did not satisfy the military. Then the firm developed a 75-mm artillery piece for coastal defense units under an order from the Ministry of Defense. Fixed and mobile versions were produced. Its production has been stopped in recent years, but it can be renewed quickly if necessary.

Back in 1951 the firm began developing the L/60 40-mm antiaircraft gun, which had high accuracy and a high rate of fire. Certain design changes were made with consideration of accumulated experience, which permitted creating a general-purpose weapon for accomplishing air defense missions. The new gun was designated the L/70. The Trinity mobile ground and sea-based AAA system was developed on its basis. The system includes a centralized fire control system based on the PS-70/R Giraffe radar of Swedish (L. M. Ericsson) production. Because of modular design the Trinity AAA system can be installed on various platforms. The system weighs 3,700 kg, it has a target acquisition range of 12 km, the maximum effective range with a target speed of up to 1,200 m/sec is 5 km against aircraft and helicopters and 3 km against missiles, and the rate of fire is 330 rounds per minute. The AAA system crew includes 4-6 persons depending on the makeup. In addition to Sweden, where over 4,000 L/70 guns have been produced, it is manufactured under license in Italy, Spain, India and other countries. The Trinity AAA system was purchased for the armed forces of Canada and the FRG. Even the U.S. Army has not lost interest in the Trinity.

The Bofors concern achieved appreciable success in designing and producing artillery pieces for coastal defense. The 75-mm and 105-mm guns installed on ring mounts in armored turrets as well as the mobile 75-mm and 120-mm mounts have seen wide use among coastal artillery guns being produced. The Karin/CD 80 mobile 120-mm artillery piece was developed in the early 1970's. The carriage with split trail and the improved laying system used in the design ensure high accuracy in firing against naval targets. The range of fire is 20 km and rate of fire is 15 rounds per minute. A projectile is being developed with a muzzle velocity up to 900 m/sec, and here the range of fire will increase to 35 km.

The firm's greatest achievement in this sphere, however, is considered to be the ERSTA 120-mm stationary gun mount developed by Bofors specialists under an order from the Swedish Ministry of Defense. Deliveries began in 1984. Its rate of fire is 25 rounds per minute (200 rounds in 20 minutes) and range of fire is up to 27 km. The 24.5 kg projectile's muzzle velocity is 880 m/sec. As a rule, the mount is accommodated in a multilevel underground shelter with self-contained support and equipped with means of protection against weapons of mass destruction. Only the armored rotating turret emerges at the surface. The crew is 11, but even 3 can conduct fire. The present production rate is two mounts per year. They are in the armament of coastal artillery units of Sweden and Norway.

The FH 77A (export version FH 77B) 155-mm howitzer is a well-known product of the Bofors concern. Work to create it began back in 1965. A contract for developing a towed 155-mm howitzer was concluded with the Swedish Ministry of Defense in 1975. One of the client's main requirements was high mobility on rugged terrain and deep snow. The SBAT 111S (6x6 or 8x8) vehicle of the SAAB-Scania firm was chosen as the prime mover. It provides a highway towing speed of 70 km/hr and a speed on difficult terrain of 8 km/hr. The howitzer weighs 11.5 tons in travel mode and it is 11.6 m long. The range of fire is 19-22 km depending on the projectile. The rate of fire is as follows: 3 rounds in 6-8 seconds, 6 in 20-25 seconds and 6 rounds every other minute for 20 minutes. The crew is 6, and many labor-intensive operations are performed by hydraulics.

The 155-mm howitzer is supplied to the armed forces both of Sweden and other countries. In particular, Nigeria received 48 FH 77B howitzers. Their production has been arranged for India's armed forces.

The Swedish **armored industry** has achieved appreciable success. It essentially completely meets the requirements of its armed forces and delivers a considerable portion of the products for export. The sector has 268 enterprises with some 75,000 employees. The primary suppliers of these products are the concerns of Nobel Industrier, Haegglund ok Soener and SAAB-Scania. The largest

enterprises of the sector are located in the cities of Karlskoga, Oernskoldsvik, Trollhaettan, Goeteborg, Arvika, Orgskoldsvik and others.

In 1987 the firms of Volvo and SAAB-Scania produced more than 500,000 motor vehicles, including 62,000 trucks with diesel engines.

The SBA 111 (4x4) and SBAT 111S (6x6) trucks and prime movers of the SAAB-Scania concern with a cargo capacity of 4.5 tons and 6.0 tons on rugged terrain (6 and 9 tons respectively on the highway) essentially completely support the needs of the Swedish armed forces. At the present time their production has been halted, but it can be renewed if necessary.

Plants of Haegglund ok Soener in the city of Oernskoldsvik manufacture light armored equipment and tracked vehicles, including the Bv206 articulated tracked transporters. On the highway these vehicles develop a speed of up to 56 km/hr, but are intended primarily for moving over difficult terrain, including marshy soil, deep snow and water obstacles (they have a speed of 3 km/hr afloat). The engine starts at an ambient air temperature of down to -40°C. The all-terrain vehicle is used for transporting personnel and cargoes and for towing artillery or nonself-propelled platforms. Air defense weapons, antitank weapons, radars, staff vehicle huts and so on are mounted on the Bv206 base. In addition to the Swedish armed forces (4,000 transporters have been delivered), these all-terrain vehicles have become operational with the ground forces of Norway, Finland, the FRG, Great Britain (200 vehicles) and the United States (318). These transporters have been ordered in lots by Canada, Italy and Spain to conduct tests.

A course has been set in future organizational development of the Swedish armed forces toward improving the mobility of units and subunits of the armed forces, particularly by installing antitank and antiaircraft weapons on light armored vehicles.

Western military specialists largely connect the combat effectiveness of Swedish forces with the development and production of a family of tracked combat vehicles by the firm of Haegglund ok Soener (together with Bofors), designated "Combat Vehicle 90" (Strids-fordon 90). Development of five prototypes of various purposes is envisaged: IFV, APC, 120-mm self-propelled mortar, command and staff vehicle and recovery vehicle. Subsequently other versions of the use of this vehicle base are possible (versions of a self-propelled AAA mount and a mobile observation post have been studied in particular). The combat weight of the base tracked vehicle will be around 20 tons. The possibility is being studied of installing a 40-mm or 57-mm gun produced by Bofors or the 60-mm HVMS 60 (Hypervelocity Medium Support weapon) of joint development by the Israeli firm of Israel Military Industries and the Italian firm of OTO Melara on it. In addition to the gun, it is planned to accommodate the RBS 56 antitank missile system on the combat vehicle. A variant of installing a 25-mm gun and 7.62-mm machinegun is being considered. In addition to the crew of three, the vehicle will transport eight soldiers with personal weapons. The 500 hp Volvo or SAAB-Scania diesel engine installed in the vehicle will provide a maximum highway speed of 70 km/hr and a range of 300 km. The vehicle will be able to cross water obstacles independently after brief preparation. Tests of its first models began in February 1986.

There are some 650 tanks in the Swedish army inventory, including 350 British Centurion and 300 tanks produced by Bofors during 1966-1971. In 1986 Bofors began modernization to extend the tanks' life cycle for another ten years. At the same time work is being done to create a future combat tank of the 1990's. Bofors is developing armament and fire control equipment and Haegglund ok Soener is developing the running gear. In the next few years it is planned to develop and test several tank variants based on different concepts. In 1992 the Riksdag (the Swedish Parliament) will examine results of the tests and will make a decision on choice of the tank which will become operational in the late 1990's. It is not precluded that this also may be a foreign model.

Several firms are engaged in producing **small arms and antitank weapons** in Sweden. The largest of them is the state concern of FFV, which plays an appreciable role in the country's military aviation complex. The concern's central agencies are located in the city of Eskilstuna. The AK4 7.62-mm carbines being manufactured under West German license make up the primary share of FFV products. A Swedish rifle, the AK5, is being manufactured on the basis of a Belgian rifle. Together with SAAB-Scania, rocket-propelled depth charge launchers are being produced for the Swedish navy and several types of antitank mines as well as handheld and rifle grenade launchers and several kinds of ammunition are produced for the army. Ammunition dispensers are produced under Air Force orders. But the principal product of the concern comprises the M2 and M3 rocket launchers, which have shown rather high effectiveness not only against tanks, but also against stationary reinforced objects. The latest model of the rocket launcher, the M4 Carl Gustav, received approval of the American Army command. The next step in developing antitank rocket launchers was creation of the AT4, on which FFV specialists continue to work. Simultaneously work is under way to create the Strix long-range antitank system together with the SAAB-Bofors Missile consortium. A 120-mm mortar round with guidance on the final leg of the trajectory is being developed for it. It will be fired both from a mortar and from a 155-mm gun. The range in the first instance will be 8 km and in the second instance 20 km.

Armed forces' requirements for modern **electronics** are being satisfied by the concerns of L. M. Ericsson (Radio Systems Division), Philips (Elektronikindustrier), the firm of SATT Electronics (purchased in 1987 by the

Bofors concern), as well as over 300 other medium and small Swedish firms. The country produces essentially any electronics for military purposes, including communications equipment, control equipment, navigation and radar systems, and computers. The leading position in this sector is held by L. M. Ericsson, which is in the same category as such well-known firms as the American ITT (International Telephone and Telegraph), the West German Siemens, and the French Thomson-CSF. L. M. Ericsson enterprises are located both throughout Sweden and in other countries. One of the concern's latest achievements is the Starcom military radio communications system which provides secure communications in a broad band of frequencies. Deliveries of sets to the troops were to begin in 1988.

Within the scope of improvement in the army air defense system, in 1987 the Swedish Ministry of Defense Logistic Directorate signed a contract worth 180 million Swedish kronor with SATT Electronics for outfitting air defense battalions with new computers, laser rangefinders, and fire control computers. It was planned to begin their deliveries in 1988.

Swedish manufacturers of military products pay great attention to export (for more details about Sweden's involvement in the world arms trade see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 6, 1987, pp 73-74—Yu. Sh.). The Ministry of Defense and the Military Industry Association attempt to justify the need to expand military export by substantiating this with various production and economic arguments, but such steps are encountering ever more rebuffs on the part of the public, which logically understands that the development of military production, expanding military-technical ties with NATO countries, and the increasing arms export are drawing them into the orbit of military preparations.

(To be concluded.)

Footnotes

1. JAS is an abbreviation from the initial letters of the Swedish words indicating the aircraft's combat purpose: J (Jakt—fighter), A (Attack—attack aircraft), S (Spaning—reconnaissance aircraft). Gripen means "Griffin" in Swedish. The aircraft is named that in honor of the mythical half-eagle, half-lion and reflects its dual role—the capability of combating airborne and ground targets.

Modernization of French Air Force Nuclear Forces

18010445p Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 89 (signed to press 10 Jan 89) p 91

[Article by Col V. Shturmanov]

[Text] France's strategic nuclear forces consist of three basic components (the so-called triad): ground, air and sea. The first two are in the country's Air Force and are consolidated in the Strategic Air Command.

The ground component consists of the 1st Division of intermediate-range ballistic missiles. It includes two squadrons (nine silo launchers each) armed with single-warhead S-3D missiles (range of fire 3,500 km, yield of nuclear warhead up to 1 megaton). The air component includes the 91st Wing of Mirage IV medium strategic bombers (Mont-de-Marsan Air Base). In addition, the French Air Force has five squadrons of tactical aircraft which are nuclear weapon platforms.

The foreign press reports that plans for developing the country's Air Force devote much attention to modernizing its nuclear forces. For example, in 1988 the Ministry of Defense signed a contract with the firm of Aerospatiale for developing the advanced S-4 intermediate-range ballistic missile with multiple re-entry vehicle (three warheads with a yield up to 150 KT and a range of fire of 4,500 km). Bomber aviation also is being modernized. In particular, both squadrons of the 91st Wing received 18 Mirage IV aircraft (nine each) refitted as platforms for ASMP air-to-surface supersonic guided missiles with a nuclear warhead having a yield up to 150 KT and a range of fire up to 300 km (after this the aircraft were designated Mirage IVP).

The aforementioned five squadrons of tactical aviation are part of the Tactical Air Command and are consolidated in two fighter-bomber wings: 4th (Luxeuil Air Base, two squadrons of 15 Mirage-IIIE aircraft each) and 7th (St. Dizier and Istres-de-Tube air bases, three squadrons of 15 Jaguar aircraft each). At the present time they are being refitted with new Mirage-2000N fighter-bombers which, in addition to conventional and nuclear bombs, also can carry the ASMP guided missiles. According to western press announcements, the 1st Squadron, 4th Wing already received all 15 Mirage-2000N aircraft in July 1988. By the beginning of the following year it is planned to refit its 2d Squadron as well. The refitting of 7th Wing subunits will begin after this. A total of 112 Mirage-2000N fighter-bombers have been ordered for the country's Air Force.

Command and control systems as well as the combat training of units and subunits are being upgraded at the same time (ground command posts are being modernized and airborne command posts are being set up), and a number of other measures are being taken aimed at building up France's nuclear potential.

Activation of UK 24th Airmobile Brigade

18010445q Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 89 (signed to press 10 Jan 89) p 91

[Article by Col S. Anzherskiy]

[Text] In accordance with Ministry of Defence plans based on comprehensive research and test exercises conducted with the 6th Airmobile Brigade, 3d Armored

Division during 1983-1985, the decision has been made to reorganize the 24th Mechanized Infantry Brigade, 2d Mechanized Infantry Division (stationed on the territory of Great Britain) as the 24th Airmobile Brigade (headquarters at Catterick, 70 km northwest of the city of York). Plans are for it to have three airmobile infantry battalions, artillery regiment, helicopter regiment, antiaircraft battery, signal company, engineer company and reconnaissance company as well as other combat support and combat service support subunits. Brigade personnel strength is around 5,000 persons and it will be armed with 18 105-mm guns, up to 100 Milan antitank missile systems, 24 Lynx antitank helicopters with the TOW ATGM, 18 81-mm mortars, as well as portable Javelin SAM systems and other weapons and military equipment.

Operationally the 24th Airmobile Brigade is to be subordinate to the commander, I Army Corps (in the FRG). In the assessment of British military specialists, it will be employed basically as an antitank reserve of the corps and also can be used for security and defense of the corps rear area. It is planned to assign assault transport helicopters from the Royal Air Force based in West Germany to maneuver the brigade's subunits in the combat zone.

FRG Air Force Development

18010445r Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 89 (signed to press 10 Jan 89) p 92

[Article by Col V. Utkin]

[Text] According to a statement by former FRG Minister of Defense Manfred Woerner, plans for further modernizing the country's Armed Forces devote much attention to developing the Air Force. Above all this concerns an upgrading of the aircraft fleet and reorganization of ground air defense forces and assets.

The western press notes that at the present time the FRG Air Force order of battle has five air wings armed with the latest Tornado tactical fighters (two squadrons each). A sixth wing of Tornado aircraft will be activated during mobilization deployment on the basis of an FRG Air Force subunit which is part of the allied training center at Cottesmore (UK). In addition, these aircraft are to be used to arm a seventh wing (41st Fighter-Bomber Wing, Husum Air Base), for which it is planned to purchase another 35 in addition to the 210 Tornado aircraft previously ordered.

With the objective of expanding tactical aviation's combat capabilities, it is planned to purchase 35 Tornado-ECR aircraft adapted for destroying enemy air defense command and control system radars and to organize them into two squadrons.

Tactical F-4 Phantom II fighters and light Alpha Jet attack aircraft in the inventory are being modernized at the same time as Air Force units and subunits are being outfitted with new combat aircraft.

Reorganization of ground air defense forces continues. In particular, in place of the six Nike-Hercules (being removed from the inventory) and Improved Hawk regiments (three regiments each) that existed, six special air defense commands (brigade composition) are being established in the Air Force which will have 288 Patriot SAM launchers, 216 Improved Hawk SAM launchers and 95 Roland SAM launchers. Modernization of a network of radar posts and centers for controlling air defense forces is being concluded.

Simultaneously with the aforementioned and other measures, the Air Force organizational structure is being upgraded. As a result, as the western press reports, the strength of Air Force personnel will be reduced by almost 12,000 persons and will be 98,000. This will be achieved chiefly by transferring a number of secondary missions to Army units and subunits. On the whole, according to estimates of West German experts, Air Force combat capabilities will increase considerably.

Modernization of French "Comandant Rivere"-Class Guided Missile Frigates

18010445s Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 89 (signed to press 10 Jan 89) pp 92-93

[Article by Col L. Shirkhorin]

[Text] The French Navy command is considering the question of modernizing six "Comandant Rivere"-Class guided missile frigates built during 1962-1970, although time periods for their removal from the fleet order of battle had been announced previously (F 740 "Comandant Bourdais," (Fig. 1 [figure not reproduced]), F 727 "Amiral Charner" and F 749 "Enseigne de Vaisseau Henry" in 1990; F 728 "Doudart de Lagree" and F 726 "Comandant Bory" in 1991; and F 748 "Protet" in 1992). The guided missile frigate F 725 "Victor Schoelcher" was transferred to the reserve last year.

These ships have a full displacement of 2,250 tons, a length of 102.7 m, a beam of 11.8 m and a draft of 4.3 m. Output of the two-shaft power plant (four diesels) is 16,000 hp and maximum speed is 25 knots. She has a range of 7,500 nm at a speed of 16.5 knots and an endurance of 45 days. There is a crew of 167, including 10 officers.

There are two basic modernization projects. One proposes to emphasize antisubmarine defense equipment (Fig. 2, above [figure not reproduced]). In this version it is planned to accommodate an antisubmarine helicopter

aboard the guided missile frigate, for which a telescoping hangar must be built in the aft section. The second project provides for outfitting these ships with air defense weapons—the eight-container Crotale SAM system launcher and 40-mm twin gun mount (Fig. 2, below [figure not reproduced]). In addition to that indicated above, in both versions the ships will be armed with eight launchers for Exocet antiship missiles, a 100-mm single gun, two 533-mm triple torpedo tubes, and a 375-mm rocket-propelled depth charge launcher. A final decision has not yet been made on modernization as a whole and on which of the projects will be given preference. Foreign military specialists do not preclude the possibility of refitting some of the "Comandant Rivere"-Class ships as antisubmarine defense frigates and the others as air defense frigates.

New West German Reconnaissance Aircraft

18010445t Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 89 (signed to press 10 Jan 89) pp 93-94

[Article by Col V. Kuzmin]

[Text] The FRG is working to create the most optimum combination of reconnaissance, command and control, and fire engagement forces and assets. In particular, it is planned to achieve an improvement in effectiveness of reconnaissance by adding a new air-based reconnaissance system to the network of COMINT and ELINT stations deployed along the border with socialist countries. Light, high-altitude aircraft with reconnaissance gear, which will perform missions by loitering over friendly territory, and mobile ground stations for receiving and processing data are to be the principal components of this system.

To this end, under an Air Force order the West German firm of Grob together with the American firms of Garrett and E-Systems are developing a special reconnaissance aircraft, the Egret I (military designation D-500) on the basis of the G-115 sports aircraft. It is made of composite materials (basically of glass-reinforced plastic), has a high aspect ratio wing that is straight in planform, a single-fin tail unit and a tricycle landing gear with retractable nose gear (see figure [figure not reproduced]). The power plant consists of one TPE331-14 1,600 hp turboprop engine. The aircraft has a low radar cross-section and low level of IR radiation. Its maximum take-off weight is around 5,000 kg, it has a length of 13.6 m, a wingspan of 29 m, cruising speed of 300 km/hr, a reconnaissance altitude of 15,000-18,000 m, and loiter endurance (at an altitude of 17,000 m) of 10-12 hours.

Judging from foreign press reports, the aircraft's onboard gear will include a COMINT set and radio direction-finder. Reconnaissance data will be transmitted from aboard the aircraft over radio channels to a mobile ground station, and after processing and analysis will be used for planning weapon employment. It is believed that this system will be able to be used for engaging enemy second echelons or reserves. Each such station is to allow interworking with three aircraft simultaneously.

The program for creating the new reconnaissance system is divided into three phases. Development and flight testing of an aircraft prototype will be conducted in the first phase (late 1986-spring 1989). In case of positive test results it is planned to move on to constructing and testing preseries models of the aircraft as well as of the ground data receiving and processing station in early 1989 (second phase). In the third phase the decision will be made on continuing the program and purchasing 14-20 aircraft and several ground stations. Combat readiness of the new reconnaissance system should be achieved by the mid-1990's.

NATO Helicopter of the 1990's

18010445u Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 1, Jan 89 (signed to press 10 Jan 89) p 94

[Article by Capt 1st Rank Yu. Shtokov]

[Text] It is planned to accept a new helicopter, designated the NH-90 (NATO Helicopter of the 1990's) in the inventory of armies of a number of West European countries in the mid-1990's. Leading aircraft construction firms of four countries—Aerospatiale (France), Agusta (Italy), Messerschmitt-Boelkow-Blohm (FRG) and Fokker (Netherlands)—are taking part in creating it. The British company of Westland also took part in the initial stage of development and later left the consortium for financial considerations.

The work of those partners is distributed as follows:

—Aerospatiale is responsible for developing the main and tail rotors as well as the antivibration system and for organizing series production;

—Agusta is responsible for developing the airframe design, transmission, electrical equipment, and general helicopter configuration;

—Messerschmitt-Boelkow-Blohm is responsible for designing the fire control system and auxiliary equipment;

—Fokker is responsible for developing navigation equipment, the pilot's cockpit with necessary instruments, and overall configuration of helicopter equipment.

In the opinion of foreign experts, the joint development will reduce the costs of creating the helicopter by 10-20 percent for each country.

The latest achievements in the sphere of aircraft construction will find use in this helicopter's design. Two helicopter variants will be created on the basis of the base model. The first of them, TTH (Tactical Transport Helicopter), is for transporting personnel and light combat equipment with an overall payload of up to 2,000 kg. The maximum flight range will be 700 km, and with suspended external fuel tanks it will be 1,400 km at a speed of 160 km/hr. The second variant, NFH (NATO Frigate Helicopter), is for hunting and killing submarines and will be based on ships of the frigate type. It is planned to equip this helicopter with a sonar, sonobuoys, magnetic anomaly detector and two antisubmarine torpedoes.

Common to both versions of the NH-90 helicopter will be two 1,500 kw gas-turbine engines, an electro-remote flight control system, communications gear and other components. Total helicopter weight will be 8-9 tons.

In June 1990 it is planned to begin helicopter ground tests and to make the first flight in January 1992. It is planned to begin series production of the new helicopters after completion of testing in September 1993. Assembly lines will be created at enterprises of the firms of Aerospatiale, Agusta and Messerschmitt-Boelkow-Blohm. Some 700 helicopters (not counting export orders) will be manufactured with consideration of the needs of the four participating countries.

Articles Not Translated from ZARUBEZHNOYE VOYENNOYE OBOZRENIYE No 1, January 1989

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